

The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide

Nov., 1927

VOL. IX.,



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The authors of papers are responsible for the facts recorded and opinions expressed.

Address of the Section: C/o Royal Society's Rooms, Institute Building, North Terrace, Adelaide.

Published Quarterly

Single Copy—NINEPENCE

Obtainable from Cole's Book Arcade, No. 14 Rundle Street, Adelaide.

Felstead & Omsby, Print. Gilbert Place, Adelaide, 'Phone C. 1531

The South Australian Naturalist.

Vol. IX.

NOVEMBER, 1927.

No. 1

FORTY-FOURTH ANNUAL REPORT OF THE FIELD
NATURALISTS' SECTION OF THE ROYAL SOCIETY
OF S.A. (INC.) for the year ended August 31st, 1927.

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The Committee has pleasure in presenting the following report for the information of the members.

MEMBERSHIP. The number of members on the roll at the close of last year was 186, of whom 149 were financial. During the year under review 33 new members were enlisted; on the other hand 35 have resigned and our loss by death has been 5 making, at the present time, a grand total of 179, out of this total 138 are financial.

EXCURSIONS. A good programme of excursions had been arranged, though occasionally the attendance has not been gratifying to the leaders.

The best thanks of the Section are due to those who have led excursions and otherwise entertained the members. During the session 28 excursions have been held, and tram, train and charabanc have been made use of to reach the destination. The subjects dealt with have been Botany, Bird Life, Orchids, Cultivated Wild Flowers, Geology, Glacial Features, Autumn Tints, Shells and Fossils, Physiography, the Native Currant, Foothill Gums, Fungi and general Natural History subjects.

LECTURES AND EXHIBITS. We are much indebted to our Lecturers and we have had a remarkably fine series this year. On September 21st, 1926, Mr. W. J. Kimber lectured on the Cephalopods (Mollusca). On 19th October, Dr. H. Basedow lectured on "Primitive" Australia" illustrated by lantern slides. On 19th November, Mr. H. M. Hale gave a Lantern Lecture entitled "Defensive Devices of Marine Animals". On 15th March, 1927, Miss E. D. Macklin, B.Sc. lectured on "Seaweeds".

On 19th April, Dr. C. Fenner, F.G.S., Mr. W. Ham, F.R.E.S., and Mr. E. H. Ising lectured on a "Trip to Western Victoria." Three lantern lectures followed, on trips undertaken, viz. 17th May, Mr. H. M. Hale, "A Naturalist in North Queensland"; 21st June, Mr. G. F. Hussey "Across two Continents—Europe and America" and Mr. Edgar R. Waite, F.L.S., "A Naturalist abroad"; 16th August, "West Australian Evening" by Messrs. J. F. Bailey, A. M. Lea, F.E.S., H. M. Hale, Dr. C. Fenner and E. H. Ising.

Lecturers have usually shown a good series of exhibits and they have always proved interesting and educational. The Committee invites more members to take part in this important part of the activities of the Section.

"THE SOUTH AUSTRALIAN NATURALIST." Our Journal has been published each quarter and under the capable guidance of Mr. W. Ham, the editor, some interesting articles have been published. Anthropology has been represented by articles from Messrs. N. B. Tindale, H. M. Hale and J. W. Hosking, Entomology by Mr. F. G. Holdaway, B.Sc., Conchology by Mr. F. Trigg (Hon. Sec. Shell Collectors' Club), Botany by Messrs. J. M. Black, L. Reese, J. F. Bailey, Prof. J. B. Cleland and Mr. E. H. Ising and general topics by Mr. W. Ham. The cost of printing Nos. 1 to 3 of Volume 8 is approximately £50. The part No. 4 to be issued shortly will complete Volume 8.

EXCHANGES. Local, Interstate and Foreign exchanges are still maintained and it is hoped that members will make full use of the publications received.

FLOWER SHOW, 1926. The Eighth Annual Flower Show, held on 15th and 16th October in the Adelaide Town Hall, was very successful excepting financially. Only £25/4/1 was cleared this year as compared with £43/6/4 the last year, 1925. There is no doubt about the educational value of the Exhibition and it is hoped that efforts will be redoubled this year to make it known as widely as possible and make it more attractive still.

HERBARIUM. The work of the Herbarium is well maintained through the indefatigable efforts of Prof. J. B. Cleland and several members. There is still plenty of work to do in sorting and identifying specimens and the Committee will welcome volunteers. Several collections have been received during the year, collectors being, amongst others, Mr. and Mrs. C. Pearce, Thevenard; Mr. L. J. Kesting, Tead Teacher, Mavis Elefson, Lionel Mudge and Alex Lovegrove, Wirrulla School, Eyres Peninsula, and Mr. F. D. Warren, Finnis Springs, via Marree. A fine lot of flowers was pressed from the various Schools' Exhibits sent down to the Show.

AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Hobart, January, 1928. On receipt of an invitation to send delegates to this meeting, Dr. C. Fenner and Mr. E. H. Ising were appointed to represent the Society.

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FIELD NATURALISTS' SECTION OF THE ROYAL
SOCIETY OF SOUTH AUSTRALIA.

The Thirty-Ninth Report of the Flora & Fauna Protection Committee for Year ending August 1927.

The chief business for the year concerned the protection of the Native Currant. Letters were received from Mr. Fred. C. Richards, Assistant Secretary Central Agricultural Bureau, mentioning that a resolution was carried at the Conference of Lower North Branches of the Agricultural Bureau, which read as follows:—

"That the Government be requested to take steps to ensure the protection of the Native Currant (*Acrotriche depressa*) on Crown Lands by the addition of a suitable Clause in the Agreement."

Letters were also received from residents of Williamstown District regretting the wholesale destruction of the Native Currants by persons visiting the District.

Letters on the same subject were also received from Mr. F. Coleman, Saddleworth, and Mr. Edwin Ashby.

At a meeting held on 22/3/27 the matter was deferred until the next meeting. The next meeting was held on the 30th June, 1927. At this meeting Mr. E. H. Ising resigned his Office (as Secretary pro tem) and Mr. Machell was appointed Secretary. The question of the protection of Native Currants was further discussed and the Secretary instructed to see what could be done in the matter.

Captain S. A. White was granted leave of absence during his trip abroad. Mr. W. Champion Hackett was appointed Acting Chairman.

A letter of thanks was sent to the Minister of Agriculture for action taken in curtailing the open season for opossums. An appropriate reply was received.

At a meeting held on 21st July, 1927 a report was presented by the Secretary re protection of Native Currants. It was found that no Act was in force to ensure protection. Notices re destruction of plants in Parks and Reserves were posted from time to time and similar notices had at one time or another appeared on certain Crown Lands re destruction of Native Currants, etc.

The Secretary for Lands intimated that if a request for such notices to be posted were sent from this Committee it would receive consideration.

The Secretary of the Williamstown Agricultural Bureau was written to with regard to the notices but reply was received that their effectiveness was doubted. However, the Secretary for Lands had been communicated with on the matter and the Secretary of the Flora and Fauna Committee is proceeding to push the work further.

It is to be hoped that members will take a keen interest in the work of the coming year and lend all support possible.

Sgd. J. E. LEWIS MACHELL,

Hon. Sec. F. & F. Prot. Com.

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ANNUAL REPORT OF SOUTH AUSTRALIAN SHELL COLLECTORS' CLUB.

This Club held 20 Evening Meetings during the year just closed, the average attendance being 13 out of a total of 18 members.

A great deal of useful work was accomplished during this period members having applied themselves to the study of South Australian Mollusca in a most encouraging manner.

At each meeting definite families of shells were under survey, specimens of which were exhibited and viewed microscopically when necessary. Most of the known facts concerning them were mentioned, different authorities consulted, and many new thoughts and theories were expressed relative to them by members.

A preliminary review of all known S.A. Bivalves and Univalves has now been completed, comprising over 1000 varieties. It is the intention of this Club to immediately begin a closed and more specialized study of these forms.

All members are now in possession of a complete catalogue of S.A. Mollusca revised up to date. For this we have to express thanks to Sir Joseph Verco. These lists have been typed at the expense of Club Members. Thanks are also due to the Royal Society for providing better lighting on the table, which became very necessary, especially when dealing with small material. Most members have assiduously collected specimens during the year, catalogued and mounted them for reference, and should now be possessed of a fair elementary knowledge of this interesting and fascinating branch of Scientific study.

Adelaide, 30th August, 1927. Sgd. W. J. KIMBER, Chairman.

F. TRIGG, Hon. Sec.

SOUTH AUSTRALIAN SHELL COLLECTORS' CLUB.

A continuation of the study of our local Mollusca was proceeded with during the quarter just ended.

Family *THAIDAE*.

Tryon, an eminent conchologist, separated the family *Muricidae* into two main divisions, the general distinguishing characteristic being:—

1. *Muricinae*.—Shell with spiny branch-like extensions of the Varices, and operculum with a central nucleus.

2. *Purpurinae*.—Shell without varices, but replaced with nodules, and nucleus of operculum in a lateral position.

The latter sub-family, however, is now considered distinct, and our South Australian Shell illustrated comes under the Family *Thaidae*. This shell is commonly distributed throughout the States, and is known here, as well as in other parts, popularly, as a whelk. Living on and in the crevices and overhanging ledges of exposed rocks, between tide marks, it is subjected to daily wave battering. As might be expected the shells are strongly and stockily built, thus enabling them to endure this hard usage. Cooke, an English conchologist, records wide variation of structure of this shell on account of environmental conditions. He points out that those living on exposed rocks are generally smaller with wide mouths enabling them to more firmly adhere to rocks under stress, whereas those in calmer situations grow to larger size and have a more contracted aperture. The *Thaidae* are carnivorous molluscs, having ovate apertures. A general collection of shells may be classified roughly as either carnivorous or vegetarian feeders by an examination of the mouth, viz:—round mouths, vegetarian; ovate, carnivorous. One generally finds the whelks congregated and associated with the mussels that cover some of our rocks, these bivalves no doubt, providing a convenient food supply. Another point of interest is the fact that their breathing organs are specialized so as to enable them to live quite comfortably on the rocks when tides are out, in addition to withstanding the sun's heated rays. Most collectors quickly discover that few shells can live under such conditions for any length of time. These whelks, or their European cousins at least, contain a small quantity of purple

fluid, secreted in a vein, which after being extracted by crushing quantities, produces a fine purple dye. Almost every work on conchology mentions the fact that the ancients commonly used this valuable extract for the purpose of dyeing the robes of the nobility. Our common type rejoices under the name of *Thais succincta* (Martyn). This specimen shows great variability of structure one variety hitherto known by the specific name of *textiliosa*, (b), was considered distinct. Its cancellated surface resembles a woven fabric, presenting a striking contrast to the shell known as *succincta*, (a), with its distinct cartwheel-track-like grooves running across the body whorl. However, large series can be arranged bridging over every variation between these two extremes, hence the abandonment of the name *textiliosa* in favor of the general embracing name *succincta*. It seems reasonable to assume that this extra reinforcement in the way of strongly ridged grooves has been developed by shells inhabiting rough places. The two specimens showing these differences were both collected on Middleton Beach. The grooved variety is rare in this State, apparently being more common on the Eastern Coasts of Australia. An examination of a number of young shells showed distinct grooving in nearly every case, but as the shell matures, this characteristic gives place to the *textiliosa* type. The shell is white and usually collected well stained and covered with serpulæ and marine growths. The inner edge of the crenulated aperture is orange coloured.

November, 1927.

F. TRIGG,

Hon. Sec. S.A. Shell Coll. Club.

With many other citizens the members of the Section have joined in a protest against the wanton destruction of the beautiful avenue of trees on the north side of North Terrace. These elms, now forty years old, give a charm to the Terrace and afford delightful shade in the summer months. Over a dozen trees have already been sacrificed to extend the area of dusty roadway. We sincerely hope that a halt will be called before this unique walk is destroyed.

THE PLANTS OF THE ENCOUNTER BAY DISTRICT.

Notes on the Ecology (Continued*)

By J. B. Cleland, M.D.

*Vide Vol. VII, No. 2, Feb., 1926, page 51; No. 3, May, 1926, page 80; and Vol. VIII, No. 4, Aug., 1927, p. 53.

VII. The Now Grassy Hill-slopes.

Encounter Bay, Pt. Elliot and Middleton are partly encircled by hills now cleared and under grass and crops. From the townships the ground rises in undulations to these hills. Only vestiges of the original vegetation remain and we have now unfortunately no clear idea of the flora that has disappeared and which was evidently recognised by the early settlers as indicating land worth clearing. It is true that fresh lands on the upper slopes are still being cleared and additions thus made to the grass land but the vegetation here has probably already been considerably altered by partial grazing. Such an area at Encounter Bay consisted of a very open forest of *Eucalyptus leucoxylon* with some *E. fasciculosa* and in places *Casuarina stricta* and an occasional *Exocarpus cupressiformis*. A few small shrubs were interspersed amongst these small trees. Doubtless this country has always been rather open on the hill-slopes, but on the foothills and the adjacent flatter country was probably more bushy with few trees.

The flora of this area may be looked at from the point of view of the native plants and from that of the introduced species that have replaced most of the original species. The Australian plants remaining may be divided into those which have survived by accident as it were, either being left for shade or on a roadside or in some rocky patch or on poorer soil not worth while clearing thoroughly, and into those which have for some reason or other been able to compete with the introduced weeds and grasses.

Native Plants Surviving by Accident.—Here the effects of ploughing and cultivation are very noticeable, leading to the permanent disappearance of practically all members of this group. The more hilly parts are, however, unsuitable for ploughing and here remnants may be found. On the hill-slopes at the back of Encounter Bay is a small somewhat rocky area covered with a colony of *Acacia armata*. These shrubs give cover and protection for some other Australian species such as *Anguillaria dioica*, *Microtis porrifolia*, *Muehlenbeckia adpressa*, *Drosera glanduligera*, *D. Whittakeri*, *Kennedya prostrata*, *Glycine tabacina*, *Halorrhagis* sp., *Scaevola microcarpa*, *Olearia ramulosa* and *Lepto-*

rhynchos squamatus. Elsewhere, surviving more or less by accident, may be found:—*Cheilanthes tenuifolia*, *Lepidosperma concavum*, *Juncus pauciflorus*, *Casuarina stricta*, *Grevillea lavandulacea*, *Acacia pycnantha*, *Stackhousia monogyna*, *Astroloma humifusum* and *Goodenia amplexans*.

Native Plants More or Less Holding their Own.—*Themeda triandra*, Kangaroo Grass, is one of the few Australian species holding its own in the grass-land and then only when reasonably protected from being eaten too heavily or ploughed up. It is not abundant. *Microlaena stipoides* has been found under the shelter of a wall. Occasional *Stipas* of several species may also be found but these grasses are more abundant on uncropped roadsides, in partly protected scrub or in the sandier soil near the sea. *Rottboellia compressa* is occasionally found. The neat little sedge, *Schoenus apogon*, occurs sometimes in little communities holding its own in competition. *Oxalis corniculata* establishes itself easily. *Convolvulus erubescens* is scattered here and there as is *Lythrum hyssopifolia* (often in furrows). *Acaena ovina* and *A. Sanguisorbae* are sometimes seen round the edges of fields or in the shelter of a wall.

These results are interesting. It will be seen that the only native species that has been able to maintain itself easily as a weed in this area, so altered by man's influence, is *Oxalis corniculata*. *Schoenus apogon* does so occasionally only, *Convolvulus erubescens* and *Lythrum hyssopifolia* are somewhat successful and the useful *Themeda triandra* and the *Stipas* only when given some protection.

The Introduced Plants.—On the grassy uncultivated hill-slopes, apart from the grasses themselves, the abundant plants are *Romulea parviflora* (a wire-weed), clovers and medics and *Melilotus indica*, species of introduced *Erodium* (Crane-bills), *Plantago lanceolata*, *Cryptostemma calendulaceum* and *Hypochaeris radicata*. Amongst the grasses are *Festuca rigida*, *F. Myuros*, *F. bromoides*, and *Poa annua*. *Rumex acetosella* is abundant in sour ground. Round the edges of crops and in the shade and protection of hedges and fences are met with *Phalaris minor*, *Aira minuta*, *Avena* (Wild Oats), *Bromus maximus*, *Lolium temulentum*, *L. perenne*, *Cerastium glomeratum*, *Silene gallica*, *Fumitaria muralis*, *Lithospermum arvense*, *Stachys arvensis*, *Linaria Elatine* and *Sonchus oleraceus*. In the stubble from crops may be found:—*Avena fatua*, *Poa annua*, *Rumex acetosella*, *Lythrum hyssopifolia* (native), *Linaria Elatine*, *Plantago lanceolata* and *Cryptostemma* (Cape-weed).

As other plants less widely distributed may be mentioned:—*Oxalis cernua* (Sour-sop), *Linum gallicum* (in places very abundant in grass-land), *Vicia sativa*, *Anagallis* (Pimpernel), *Erythraea centaurium* (Century), *Plantago coronopus* (on grass-land near the lower sandy flats) and *Sherardia arvensis*.

Amongst accidental introduced plants may be noted *Rubus fruticosus* (Blackberry), *Ulex europaea* (Gorse), *Oxalis* sp. (a garden escape, forming a small patch), *Salvia verbenacea* and *Solanum Sodomaeum*.

XV. The Flats Behind the Sandhills at Encounter Bay.

Flats extend from the low sandhills skirting Encounter Bay till the ground begins to rise into foothills. Their extent is only about two miles in each direction and they are partly encroached on by houses, fields and gardens. Travertine limestone in many places comes near the surface or is actually exposed and one small swamp still remains or rather has been imperfectly drained. Where the limestone is very near the surface, little pasture secures a hold. Elsewhere there is a certain amount of food for cattle and horses. This area was probably originally covered with a thick but low scrub in which it is likely that *Leptospermum* formed a conspicuous feature, with sedges and rushes in the damper or swampy portions which would be small. There is now no indication of this primeval covering of plants, though a number of small native plants have been able to survive amongst the introduced ones and in spite of the cropping by animals. Portion of this area has recently been subdivided and in a score of years a flourishing seaside town will cause all vestiges of the original plant life to disappear.

Amongst the native plants that are more numerous, the following may be mentioned:—*Pteridium aquilinum*, Bracken Fern, occurs on a slight sandier rise. *Imperata cylindrica*, Blady Grass, forms occasional small colonies, usually in rather sandy soil. *Distichlis spicata* is abundant in the more low-lying parts. *Scirpus nodosus* sometimes occurs as tussocks. *Cladium junceum* colonises water-logged depressions. *Cladium flum* forms tall tussocks in land wet in winter. There are some little groups of *Juncus pauciflorus*. *Selliera radicans* is abundant in the semi-swampy areas.

Native plants which are few in numbers are comprised in the following:—*Ophioglossum coriaceum*, Adder's Tongue (a small patch found flowering in August), *Triglochin centrocarpa*, *Lepidosperma gladiatum*, *Anguillaria dioica*, *Caesia vittata*, *Hypoxis glabella*, *H. pusilla*, *Microtis porrifolia*, *Drosera auriculata*

(fairly numerous in places), *Acaena*, *Acacia armata*, *A. pycnantha*, *Kennedyia prostrata*, *Glycine clandestina* (amongst the bracken), *Oxalis corniculata*, *Astroloma humifusum*, *Samolus repens*, *Convolvulus erubescens*, *Wilsonia rotundifolia* (small mat like colonies amongst the travertine limestone) and *Vittadinia australis*.

In addition, in the protected and rather neglected cemetery at Encounter Bay, the following indigenous species are to be found, probably remnants of the original flora, viz., *Dianella revoluta*, *Rhagodia baccata*, *Rh. nutans*, *Acacia calamifolia*, *Pimblea glauca*, *Halorrhagis* sp. and *Olearia ramulosa*.

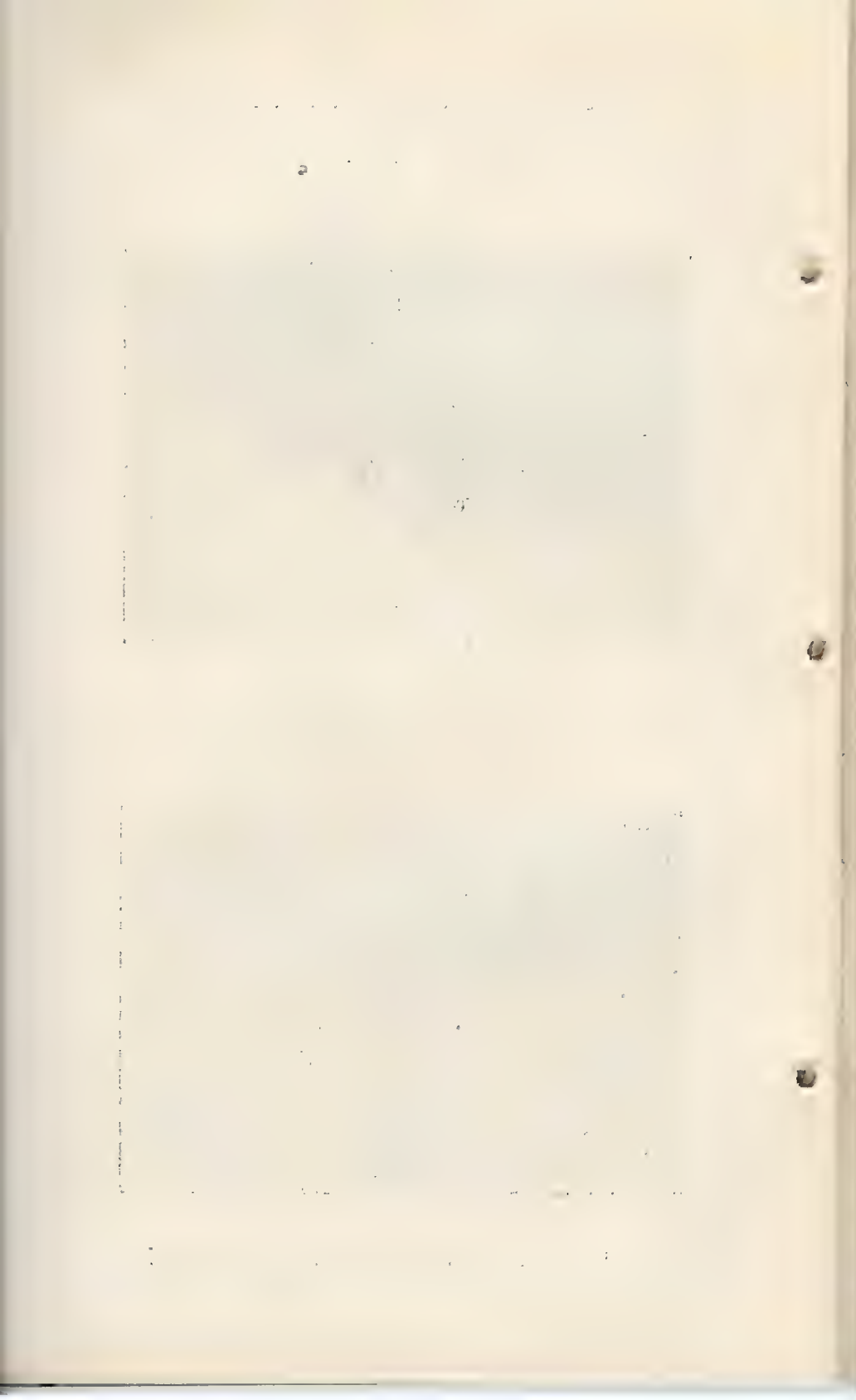
Of the introduced species the commonest are:—*Lagurus ovatus* (in sandier parts), *Avena*, *Poa annua*, *Hordeum maritimum*, *Medicago denticulatum*, *Cryptostemma calendulaceum* and *Hypochaeris radicata*. Occasional plants of the following were also noted:—*Briza maxima* (in the cemetery), *Rumex acetosella* (in sour ground), *Rumex* spp., *Polygonum aviculare*, *Cerastium glomeratum*, *Silene gallica*, *Fumitaria muralis*, *Vicia sativa*, *Oenothera odorata*, *Anagallis*, *Olea europaea*, *Plantago lanceolata* (in the cemetery), *Scabiosa maritima* (fairly abundant in places), *Inula graveolens* and *Sonchus oleraceus*.

The total native species here recorded are 36 and the introduced species 22.

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NAMED SOUTH AUSTRALIAN PLANTS IN THE WILD FLOWER SHOW.

A feature of the Annual Wild Flower Show is the table devoted to named specimens of the South Australian Flora. Students, school and others, are in this way given an opportunity of learning the correct scientific names of many of our plants or of confirming their own identifications when in doubt. It has seemed of value to tabulate the species thus exhibited. This year owing to the Show being held three weeks earlier than usual, the number of species displayed has only totalled 138. The reduction in numbers has especially affected the orchids. Those species exhibited last year but not available this year are added in heavy brackets, thus [...], after each family. The total number shown in 1926 was 155. A number of species not included in this year's 138 were to be seen on various other tables but time did not permit of their being drafted on to the special table for named species. This named list also does not include over 30 species of our vascular ephemeral microflora exhibited on a special table or Australian species from other States.



Red-gum Struck by Lightning at Finniss.



Fig. 1. General view, showing the widely scattered branches.



Fig. 2. The longitudinally cleft trunk, 20 ft. in circumference.

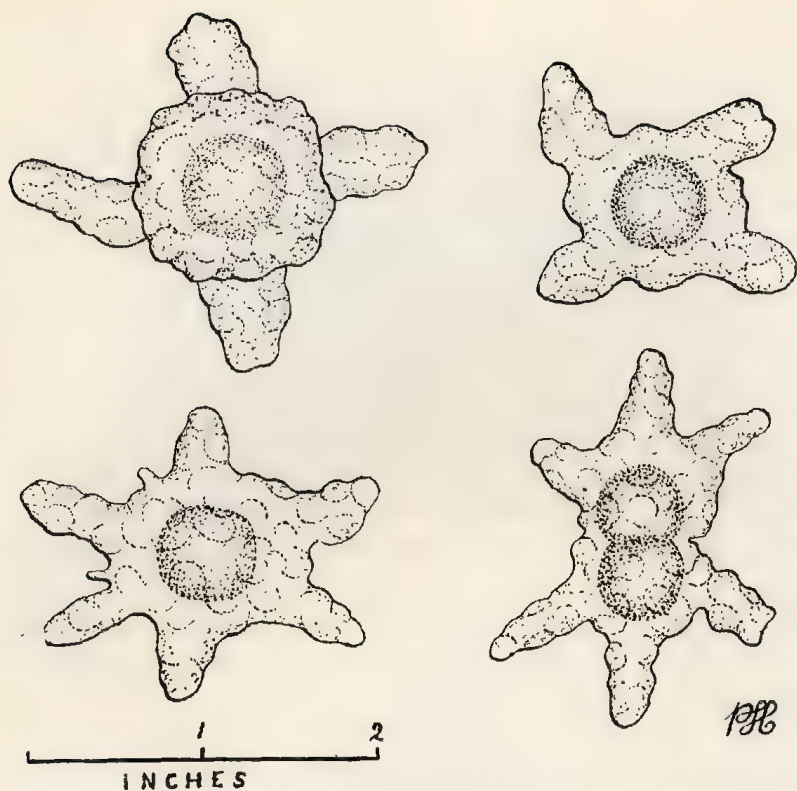


Fig. 1. Four of the hailstones which fell at Magill on August 4th, 1927.

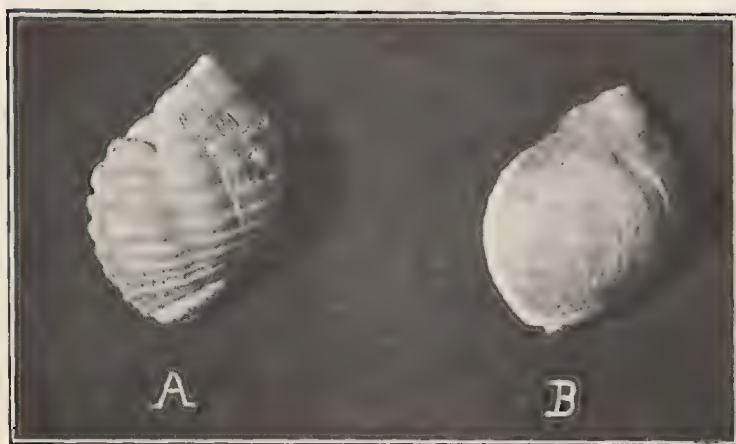


Photo by R. C. Edwards.

(a)

(b)

Thais succincta (Martyn)

FILICALES:—*Adiantum aethiopicum*, *Cheilanthes tenuifolia*, *Pteridium aquilinum*, *Blechnum discolor*.

[PINACEAE:—*Callitris robusta* (Kinchina), *C. verrucosa* (Kinchina)]:

GRAMINEAE:—*Stipa scabra* (Kinchina). [*Themeda triandra*, *Stipa elegantissima*, *S. variabilis*, *S. semibarbata*, *Danthonia penicillata*, *Koeleria phleoides*, *Poa caespitosa*].

CYPERACEAE:—*Chorizandra enodis*.

RESTIONACEAE:—*Leptocarpus tenax* (Mt. Compass).

JUNCACEAE:—*Luzula campestris*.

LILIACEAE:—*Dianella revoluta*, *Burchardia umbellata*, *Anguilaria dioica*, *Thysanotus Patersonii* (Kinchina, with a bunch of large tubers), *Gaesia vittata*, *Bulbine bulbosa*. [*Lomandra longifolia*, *Calectasia cyanea* (Bordertown)].

IRIDACEAE:—*Orthrosanthus multiflorus*.

ORCHIDACEAE:—*Thelymitra antennifera*, *Caladenia Patersonii*, *C. dilatata*, *C. latifolia*, *C. carnea*, *Glossodia major*, *Diuris pedunculata*, *D. palustris*, *D. maculata*, *Pterostylis curta*, *Pt. pedunculata*, *Pt. cynocephala* (Kinchina). [*Calochilus Robertsonii*, *Thelymitra ixioides*, *T. grandiflora*, *T. aristata*, *T. pauciflora*, *T. carnea*, *Microtis porrifolia*, *Prasophyllum elatum*, *P. odoratum*, *Lyperanthus nigricans*, *Caladenia leptochila*, *C. Menziesii*, *Diuris longifolia*, *Pterostylis barbata*, *P. pusilla*].

CASUARINACEAE:—*Casuarina striata*.

PROTEACEAE:—*Isopogon ceratophyllus*, *Conospermum patens*, *Hakea rostrata*, *H. ulicina*, *H. ulicina* var. *flexilis* (Kinchina), *Banksia marginata*, *B. ornata*, *Grevillea ilicifolia*, *G. lavandulacea*, *G. lavandulacea* var. *sericea* (Kinchina). [*G. Huegelii* (Sedan)]

SANTALACEAE:—*Fusanus acuminatus* [*F. persicarius*].

AIZOACEAE:—*Mesembrianthemum aequilaterale*.

RANUNCULACEAE:—*Ranunculus lappaceus*, *Clematis microphylla*.

DROSERACEAE:—*Drosera Whittakeri* [*D. Planchonii*].

PITTOSPORACEAE:—*Cheiranthra linearis* (Myponga). [*Billardiera cymosa*].

ZYGOPHYLLACEAE:—*Zygophyllum*, sp.

RUTACEAE:—*Boronia Edwardsii* (also white form), *B. caerulea*, *B. pilosa* (Burrungul, S.E.), *Correa aemula* (Myponga), *Eriostemon brevifolius*, *Phebalium bullatum* (Pinbaroo). [*Zieria veronica* (Bordertown)].

LEGUMINOSAE:—*Acacia continua*, *A. obliqua*, *A. verniciflua*, *A. rhetinodes*, *A. ligulata* (Cambrai), *A. myrtifolia*, *A. pycnantha*, *A. calamifolia* (Kinchina), *A. sclerophylla* (Kinchina), *A. colletioides*, *A. verticillata*, *A. oxycedrus* (Burrungul, S.A.), *A. longifolia*, *Cassia eremophila*, *Daviesia corymbosa*, *D. ulicina*, *D. brevifolia* (Myponga), *Eutaxia microphylla*, *Pultenaea stricta* (Burrungul, S.E.), *P. largiflorens* (Hermitage), *P. pubescens* (Burrungul, S.E.), *Dillwynia hispida*, *Lotus australis*, *Indigofera australis*, *Swainsona lessertifolia*, *Kennedya prostrata*, *Hardenbergia monophylla*. [*Acacia spinescens*, *A. rhigiophylla* (Kinchina), *Dillwynia uncinata*, *D. floribunda*, *Pultenaea acerosa* var. *acicularis* (Myponga), *P. daphnoides*, *P. canaliculata*, *Platylobium obtusangulum* (Myponga), *Psoralea patens*].

TREMANDRACEAE:—*Tetratheca pilosa*.

POLYGALACEAE:—*Comesperma volubile*.

EUPHORBIACEAE:—*Beyeria Leschenaultii* (Kinchina), *Bertya Mitchellii* (Kinchina). [*Poranthera ericoides*].

STACKHOUSIACEAE:—*Stackhousia monogyna* (Kinchina, Houghton).

SAPINDACEAE:—*Dodonaea cuneata* (Kinchina), *D. hexandra* (Kinchina). [*D. attenuata*, *D. microzyga*, *D. bursariifolia*, *D. stenozoya*, *D. viscosa*].

RHAMNACEAE:—*Pomaderris racemosa* (Kinchina), *Spyridium parvifolium* (Kinchina), *S. thymifolium* (Mt. Compass), [*S. subochreatum*, *Cryptandra tomentosa*].

MALVACEAE:—*Hibiscus Huegelii*.

STERCULIACEAE:—*Lasiopetalum Behrii*. [*L. Baueri* (Sander-grove), *Thomasia petalocalyx*].

DILLENIACEAE:—*Hibbertia sericea*, *H. stricta* var. *canescens* (Kinchina). [*H. stricta*].

VIOLACEAE:—*Hybanthus floribundus* (Houghton).

THYMELAEACEAE:—*Pimelea stricta*, *P. phyllicoides*. [*P. humilis*, *P. octophylla* (Currency Creek)].

MYRTACEAE:—*Baeckea ramosissima*, *B. Behrii*, *Leptospermum scoparium* (Myponga), *Melaleuca gibbosa*, *Eucalyptus diversifolia* (Encounter Bay), *E. Baxteri* (Encounter Bay), *E. cosmophylla* (Encounter Bay), *E. angulosa* (Encounter Bay), *E. incrassata* (Paringa), *E. gracilis* (Kinchina), *E. fasciculosa* (Encounter Bay), *Calythrix tetragona*. [*Leptospermum coriaceum* (Naturi), *Callistemon rugulosus*, *Melaleuca acuminata*, *M. squamea* var. *glabra*, *M. uncinata*, *Eucalyptus Behriana* (Sander-grove), *E. oleosa* (Naturi), *E. leucoxydon*, *E. calycogona* (Kinchina)].

- [*HALORRHAGIDACEAE*:—*Loudonia Behrii*].
EPACRIDACEAE:—*Astroloma conostephioides*, *Lissanthe strigosa*, *Leucopogon concurrens*, *L. virgatus*, *L. ericoides* (Burrungul), *Acrotriche depressa*, *Epacris impressa*, *Sprengelia incarnata*. [*Acrotriche fasciculiflora* (Mylor)].
LOGANIACEAE:—*Logania recurva*. [*L. longifolia*].
BORRAGINACEAE:—*Halganina cyanea* (Kinchina), *H. lavandulacea* (Naturi).
LABIATAE:—*Prostanthera eurybioides* (Kinchina). [*P. Behriana* (Naturi), *P. aspalathoides* (Sandergrove)].
SOLANACEAE:—*Nicotiana suaveolens* (Kinchina).
SCROPHULARIACEAE:—*Euphrasia collina*. [*Veronica gracilis*].
[*LENTIBULARIACEAE*:—*Utricularia dichotoma*].
MYOPORACEAE:—*Myoporum viscosum*, *Eremophila longifolia*, *E. alternifolia*].
RUBIACEAE:—*Opercularia varia* (Kinchina).
[*PLANTAGINACEAE*:—*Plantago varia*].
[*CAMPANULACEAE*:—*Wahlenbergia gracilis*].
GOODENIACEAE:—*Dampiera rosmarinifolia*, *Scaevola microcarpa*, *Goodenia primulacea*, *G. robusta* (Kinchina). [*G. ovata*, *G. albiflora*, *Dampiera marifolia*].
STYLIDIACEAE:—*Stylidium graminifolium*.
COMPOSITAE:—*Olearia teretifolia* (Houghton), *O. Muelleri* (Cambrai), *O. magniflora* (Cambrai), *Vittadinia australis*, *Senecio lautus* (Kinchina), *Erechtites quadridentata* (Kinchina), *Helichrysum apiculatum*, *H. obtusifolium*, *Helipterum polygalifolium* (Cambrai), *Craspedia Richea*, *Microseris scapigera*. [*Helichrysum retusum* (Kinchina), *H. Baxteri* (Sandergrove), *H. Blandowskianum*, *H. scorpioires* (Currency Creek), *Olearia glutinosa* (Kinchina), *Podolepis rugata* (Sandergrove), *P. Lessonii* (Kinchina), *Leptorrhynchus pulchellus*].

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In consequence of the publication of the Annual Report and other papers, several of the numerous Excursions held during the past three months have not been reported in the columns of this number of "The South Australian Naturalist." One of the most pleasing was the visit to Mr. Burdett's garden at Basket Range.

Mr. C. White, the Government Botanist of Queensland gave us a very fine address on Monday, 21st November.

METEOROLOGICAL NOTES.

By Herbert M. Hale and Paul S. Hossfeld, B.Sc.

—:0:—

A Lightning-struck Tree.

The effects of lightning on trees and other objects have long attracted the attention of the scientist and the man in the street. Occasionally, particularly if there is inflammable material at the base, a struck tree is ignited by the discharge and, in densely wooded districts, a "bush-fire" may result. Records are kept of trees damaged or destroyed by lightning in the National Forests of the United States of America. The subject is of considerable importance in such areas, and reports from fifteen of the States, covering periods of from two to four years, show that in that time approximately 76,000 trees were struck.

A large dead red-gum standing in a paddock at Finnis, South Australia, was broken up by lightning in February of this year, and the following is a brief record of the occurrence. The tree was struck during a thunderstorm, on a "muggy" night, when the humidity rendered the atmosphere a good conductor. For several reasons the dead tree was peculiarly liable to receive the full force of the lightning. It was tall, stood in an isolated position, and stretched up numerous long wet arms towards the electrically charged thunderclouds; there is little doubt that it was struck by the familiar linear lightning seen during thunderstorms. Residents state that a tremendous explosion was heard when the tree was struck, and that pieces were hurled for great distances. One of us (H.M.H.) examined the tree a few months afterwards and the following notes result. The trunk (which measured twenty feet in circumferences near the base) was cleft longitudinally, about one-third of its mass being thrown outwards from the main portion, which still stands (see photographs, Pl. 1). The large spreading branches literally were burst asunder and scattered in all directions, the huge scattered limbs lying in a radius of 80 ft. around the trunk; a piece about 10 feet in length now rests 96 feet from the base of the tree, and part of a bough was thrown for a distance of nearly 300 feet, well beyond the more distant of the two fences shown in Pl. 1, fig. 2. The nearer fence was broken by the wood, and from the evidence available it appears that the last-named hit the ground near this fence, and bounded through the wire and over and over the second fence into the adjoining paddock.

Owing to their greater resistance, strong bodies are more liable to violent disruption when struck by lightning than are yielding substances. The red-gum considered here was solid excepting for a small core in the centre of the base, which was packed with material composing part of a nest of termites, or "white ants"; this core was only about three feet in height and a foot in diameter. It may be mentioned that, while the wood of the red-gum is heavy and solid, the large boughs fracture with comparative ease at the junction of the branches; it is well known that during quite moderate gales huge boughs will break off near the trunk with little warning. We have seen many instances of this, and a rather striking demonstration was recently observed by one of us (H.M.H.) in the Northern Flinders Ranges; there a living red-gum—a gigantic spreading monarch—literally fell to pieces on a windy night, every bough being detached from the main trunk.

Hailstones.

On August 4th, 1927, hailstones of unusual size and shape fell in the suburbs of Adelaide and at several places in the hills. In a paper read before the Royal Society of South Australia in 1917, Prof. Howchin gives a detailed account of a similar visitation. Both the internal and external appearances of the hailstones about to be described are, however, somewhat different from those recorded by him.

The Antarctic Low located off the south-western portion of Australia at 8.30 a.m. on August 2nd moved, during the next twenty-four hours, to a position south of Adelaide. The isobars which had been running approximately in an east and west direction were pushed slightly northwards in the direction of the High which occupied the centre of the continent. A Monsoonal Low was situated in the northern part of the Northern Territory. During the next twenty-four hours the Antarctic Low increased in energy; it pushed a tongue northwards and probably effected a temporary junction with the northern Monsoonal Low, thus breaking up the High between them into an east and a west part. Squally conditions set in over South Australia, bringing rain, hail and sleet, accompanied by severe electrical disturbances, severe hailstorms, restricted in area, visited the city and suburbs. Several areas, notably in the north-western suburbs, recorded violent squalls. A fireball was noticed in an Adelaide street, and The most severe occurred about 7 p.m. on Thursday, its approach being heralded by a thundering noise on the roofs. The falls varied considerably in the number and size of the stones, but appear to have been of only a few minutes duration in every

case noted. The specimens illustrated fell at Magill, where they were few in number, but as far as known, the largest recorded. Some which fell on a lawn were collected, and immediately measured and sketched; they were of diverse shapes, but all had certain common characteristics. Each consisted of a central, opaque, white sphere, approximately three-eighths of an inch in diameter, and surrounded by clear ice. The external shape was roughly spherical but the surface resembled that of a raspberry, appearing as if smaller hailstones had adhered to it and congealed. In addition the large majority of examples had attached at regular intervals a variable number of sharp spines, which were of about equal size. The predominant number of spines was four; when this number was exceeded, the additional tubercles were generally small and placed between the large projections. One stone, which had six large and equally developed spines, was evidently a twin, as is shown by the incomplete fusion of the central opaque white spheres.

Red-gum Struck by Lightning at Finniss.

Fig. 1. General view, showing the widely scattered branches.

Fig. 2. The longitudinally cleft trunk, 20 ft. in circumference.

Fig. 1. Four of the hailstones which fell at Magill on August 4th, 1927.

SOUTH AUSTRALIAN AQUARIUM SOCIETY.

The Annual Meeting of the Society was held on November 1st, at Mr. J. W. Hosking's rooms, Norwood. The President (Mr. Edgar R. Waite) congratulated members upon having maintained the work and interest of the Society for ten years. The membership has now reached a total of forty and a dozen of the aquarists are foundation members. The minutes of the previous annual meeting was approved, and the annual report and balance sheet were presented and adopted. Mr. Hosking, who for a decade has provided a room in which the meetings are held, was warmly thanked for the privilege accorded.

This year six general meetings and three arranged excursions were held while in addition some of the members made many informal trips in search of aquatic life. Messrs Hale, Ising, Nettelbeck, Trigg and Waite delivered addresses at the meetings, which were well attended. The annual camp, held this year at Finniss, was, as usual, most successful. Three of the members arranged an aquarium exhibit at the Wild Flower Show

of the Field Naturalists' Section of the Royal Society, held in the Town Hall in September, and this exhibit attracted considerable attention.

The following officers were elected for the ensuing year: President, Mr. Edgar R. Waite; Vice-presidents, Messrs. C. E. Cole and J. W. Hosking; Committee, Miss Roeger and Messrs B. B. Beck, C. F. Blewett, R. Carpenter, J. W. Goodale, H. Haga and T. Nettelbeck; Hon. Auditor, Mr. A. E. Wadey; Hon. Secretary and Treasurer, Mr. Herbert M. Hale.

In his presidential address Mr. Waite spoke on the Aquariums of the world, with special reference to the proposed Semaphore Aquarium. He assured Mr. T. H. Mutch, the promoter, of the great interest taken in the project by members of the Society and wished him every success in his most laudable undertaking. He outlined the various attempts made to establish a public aquarium in South Australia and regretted that the ventures, made largely at the instance of the Society, had not been more strongly supported.

The Secretary then spoke on our native fishes, showing about forty slides dealing with aquatic animals, and some of the methods adopted to obtain photographs of them. Mr. C. E. Cole afterwards exhibited lantern slides illustrating excursions of members during the past session.

HERBERT M. HALE,
Hon. Secretary.

EXCURSION TO LONG GULLY, 22nd OCTOBER 1927.

Mr. E. H. Ising led a party on a trip to Long Gully and as the train moved through the hills the leader drew attention to the successive changes in the eucalyptus forests. At Clapham peppermint (*E. odorata*) predominated, and *E. leucoxylon* (yellow gum) began to appear. Some distance further on, and in the low, well-watered gullies, the sturdy red gum (*E. rostrata*) held sway. Beyond Belair *E. obliqua* (stringybark) was in evidence in the higher levels, where the rainfall was more abundant. The geological formation to a large extent controlled the vegetation. The hardy spring bushes were at home on the quartzite strata of the sharp-edged ridges, while on the rounded grassy hills yellow gum and peppermint flourished. The stringybark generally grew above a height of 1,200 ft. In the reserve at Long Gully the pink gum (*E. fasciculosa*) was abundant. The wood

in section, showed a light pink, the bark is smooth but somewhat scaly at the base, and of a mottled appearance owing to irregularity of shedding, the colour runs from pale grey to a light brown, leaves 4 to 5 in. by 1 in. broad, and sickle-shaped, dark green and shining on both sides. The flowers are white and paniculate borne on the end of the branches (hence the specific name *fasciculosa*, meaning little bundles). The fruit is much smaller than in the other eucalypts.

EXCURSION TO GLEN OSMOND, NOVEMBER 12th, 1927

Under the guidance of Dr. Fenner a party spent a profitable time in examining the rocks near the Glen Osmond quarry. The first point of interest was found in some huge boulders—10 ft. in length, and some tons in weight—lying out in the alluvial plain in Ridge Park, as much as a mile from the ranges. These boulders had been described by Professor Howchin some years ago. They were probably carried out of the Glen Osmond gully in an exceptional flood, a so-called “cloud-burst.” At the quarries the members had their attention drawn to the difference between the bedding of the layers and the joint planes. The former had been originally laid down horizontally in shallow water, and were then subjected to intense pressure. The layers were consequently twisted and contorted or uplifted at a greater or smaller angle. The ceaseless, though gradual, movements also had the effect of splitting the layers into great blocks by joints in three directions. The percolation of water charged with mineral salts disintegrated the solid rocks. In the quarry this process could be traced to several feet from the surface. The soil above overlay a long tongue of red-coloured clay, and crossing the layers obliquely and beneath were seen layers in various stages of decay. It was in this way soil was prepared for the more lowly forms of plant life. The presence of the joint “planes” was of great importance to the quarryman and the stonemason as it was along these fissures that the stone most readily splits. In some were observed the curious fern-like traceries, technically known as “dendrites,” explained as due to the presence of manganese in the percolating water. The party ascended to the well-known white chimney. The line of the great “fault” or “rift” of the Mount Lofty Range and its continuations could be readily marked from this vantage ground. The Adelaide plains were built up from the detritus produced by the rains and streams of past ages.

EXCURSION TO IRONBARK, OCTOBER 29th, 1927

Mr. A. M. Lea, of the Adelaide Museum, led a party of Field Naturalists on an entomological expedition to Ironbark, near Upper Sturt. Whether due to the dryness of the season or otherwise, insects were not found in the numbers usually active in October. Galls were making havoc with the young eucalypts. These insects (*Psyllidae*) pierce the leaves, the sap exudes, and covers the tiny grubs. Parrots used to be very effective in keeping these insects in check. The "giant thrips" was also found on these trees, and the "shot holes" were explained as the work of a moth caterpillar. Some soldier ants were captured, and attention drawn to the gland near the tail, from which it ejects the formic acid into the wound. White ants' (*termites*) nests were rifled and the distinction between the queen, the workers, and soldiers was pointed out. The last two are wingless and blind. A carnivorous cricket (*paragryllacris*) was found in a mound constructed by the termites. A hunting spider was unearthed. This creature is torpid during the day, and seeks its food during the night. A capsule containing spider's eggs was examined. The mother spider carries these capsules on her back. When the young hatch out, they calmly proceed to devour their parent. The ground weevil owes its security to its colour, which renders it almost indistinguishable from its surroundings. These insects are wonderfully tenacious of life. Weevils, after being left in spirits for as long as 40 hours, frequently revive. These creatures are very destructive to strawberries. The eggs of the "Emperor moth" led to a chat on the habits of that peculiar insect. A dainty little green moth, known by the name of *Procris viridipulverulenta*, was captured. It owes its specific designation to a fine green powder that covers the wings. Ferocious jumping soldier ants kept observers at some distance from their mounds. Many species of wild flowers were observed, including the orchids *Calochilus Robertsonii*, *Thelymitra ixioides* with its dark spots on one sepal and two petals. The white flowers of *Leptospermum* were very abundant. Two species of mistletoe, or plant parasites were noticed, namely *Cassytha* and *Loranthus*.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

INCOME and EXPENDITURE for year ending 31st August, 1927.

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GENERAL ACCOUNT.

1926-7.		1926 7.		£ s. d.		£ s. d.		£ s. d.	
Sept. 1.		By Printing		30 0 7		61 7 10		136 0 1	
To Balance brought forward		Advertising		48 11 3		3 6 0		19 13 7	
Subscriptions		Postages, etc.				8 9 8		£155 13 8	
Other Receipts—		Hire of Hall and Lantern				5 18 6			
Grant from Royal Society		Travelling Expenses		50 0 0		0 13 1			
Flower Show		Stationery, Books, etc.		25 4 1		5 12 2			
Bank Interest		Miscellaneous		1 6 3		2 1 7			
Miscellaneous		Repayment to Royal Society		0 11 6		48 11 3			
		Bank Balance		77 1 10					
				£155 13 8					

To Balance brought forward 1st September, 1927 £19/13/7.

F. TRIGG, Hon. Sec., 31/8/27.

Audited and found correct.

WALTER D. REED, F.C.P.A. } Auditors, 31/8/27.
ALEX. MORISON }

The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide

Feb., 1928

VOL. IX.

No. 2.

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Published Quarterly

Single Copy - NINEPENCE

The South Australian Naturalist.

Vol. IX.

FEBRUARY.

No. 2

OBITUARY.

EDGAR RAVENSWOOD WAITE.

The death of Mr. Edgar R. Waite, F.L.S. C.M.Z.S., Director of the South Australian Museum, leaves yet another gap in the ranks of Australian biologists. It may be truly said that he died in harness. He was to have attended a meeting of a scientific committee in Tasmania, and although seriously ill before leaving Adelaide he made the journey in the vain hope that the voyage would cure him, but passed away in Hobart, where 700 of his friends and colleagues were gathered at the Science Congress.

Mr. Waite first came to this country in 1893 when, as a young man of 27 he was appointed to the staff of the Australian Museum, Sydney. He worked for 13 years in that institution and there produced many valuable papers, the most noteworthy dealing with reptiles and fishes of Eastern Australia. In 1906 he undertook the Curatorship of Canterbury Museum, New Zealand, and there continued his Museum work and his researches. Amongst other important contributions at this period were his publications on the vertebrates of the subantarctic islands of New Zealand, the fishes of the British Antarctic expedition and the New Zealand Government trawling expedition; he also paid special attention to the fishes, whales and ethnology of New Zealand.

Early in 1914 the Board of Governors of the Public Library, Museum and Art Gallery of South Australia appointed Mr. Waite Director of the Adelaide Museum. Soon after arrival in this State Mr. Waite commenced work on the Antarctic fishes collected by Sir Douglas Mawson's expedition, the results of his investigations forming part of one of the volumes of the scientific reports of the Australasian Antarctic Expedition. In the succeeding 14 years he prepared no fewer than 59 papers on various

subjects, the most lengthy dealing with fishes, a group in which he was a noted specialist. His catalogue of the South Australian fishes, followed later by a popular handbook on these animals, will for long be standard works of inestimable value to local investigators and others. At the time of his death he had almost completed a handbook on our reptiles and amphibians, a contribution which will be published posthumously.

Mr. Waite accompanied or led several extensive expeditions on sea and land, and undertook, as well, several shorter trips in search of Museum material. In 1912 he was zoologist on board the "Aurora" during the first subantarctic cruise of Sir Douglas Mawson's expedition and a year later he accompanied the relief expedition to Macquarie Island. Shortly after coming to South Australia he carried out investigations in the Great Australian Bight on the occasion of a Government trawling cruise. In company with Capt. S. A. White he led an expedition to Central Australia in 1916, and in 1918 went to New Guinea, New Britain and New Ireland. On this last trip he contracted malaria, many subsequent attacks of which did much to undermine his health.

Mr. Waite was editor of several publications and in this capacity was keenly critical, even of his own work; consequently publications such as the "Records of the South Australian Museum" and the Handbooks of the Science Guild (South Australian Branch) set a high standard in Australian productions. He was a most versatile naturalist and his enthusiasm brought him into touch with many of the smaller clubs as well as the more learned societies. He took an active part in our Field Naturalists' Section and delivered many addresses at the gatherings. He made many friends amongst our members and during excursions and meetings always had a kindly word for the youngest enquirer. For many years he was interested in the keeping of aquaria and was largely instrumental in the founding of the South Australian Aquarium Society, of which body he was president for nearly a decade. He was very desirous that a public Aquarium should be erected in our State and was eagerly looking forward to the erection of the proposed Semaphore Aquarium.

Many friends mourn the loss of Mr. Waite, who was held in high esteem by all with whom he came into contact. He will be sadly missed in scientific circles; the 176 papers and books he prepared during his life of research alone attest to his activity in this direction.

SOUTH AUSTRALIAN ETHNOLOGICAL NOTES.

By Paul S. Hossfeld, M.Sc.

In a paper published in the Proceedings of the Royal Society of South Australia, 1926, on page 289, the writer referred to a cave-drawing which may have been executed by an aborigine. The rock shelter is situated north of the River Marne (South Rhine), south-east of Eden Valley, and is described in the above paper as Cave B. The drawings shown in Figure 1 are at the back of this cave and have been made with a soft, white stone. They may represent swans or other long-necked birds. The base line is formed by the bottom of the wall and has not been outlined in the original drawing, but nevertheless, probably was used as part of the design. Although definite proof of their native origin seems impossible, these drawings are placed on record as probable examples of native art.

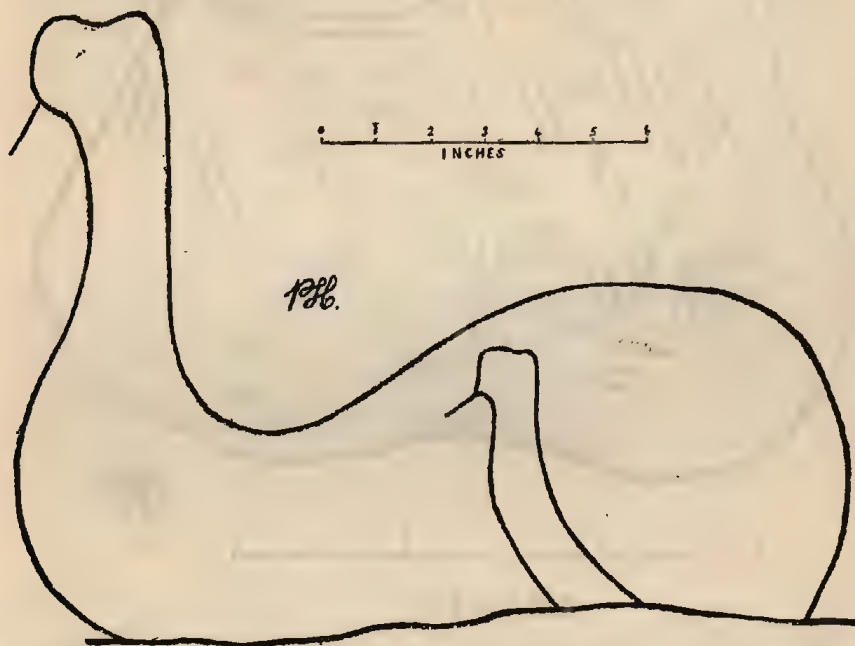


Fig. 1. Drawing from Cave B, River Marne (South Rhine), South Australia.

A number of reniform slates of native origin have been described during recent years*. Their use and significance have been discussed and different opinions expressed. Their use as skin-scrapers has been advocated by Dr. Basedow, a view which is supported by the shape of all those described hitherto. The

one shown in Fig. 2, however, which was found by the writer at Normanville, S.A., in 1925, contradicts this. Although it possesses the characteristic concave marginal incision, which has as usual been produced by artificial abrasion, the stone itself is apparently unsuitable for use as a scraper. The size, shape and position of the incision and the shape of the stone itself indicate this. The specimen consists of slate or shale. The special points of interest are: Its unusual shape (sub-triangular instead of reni-

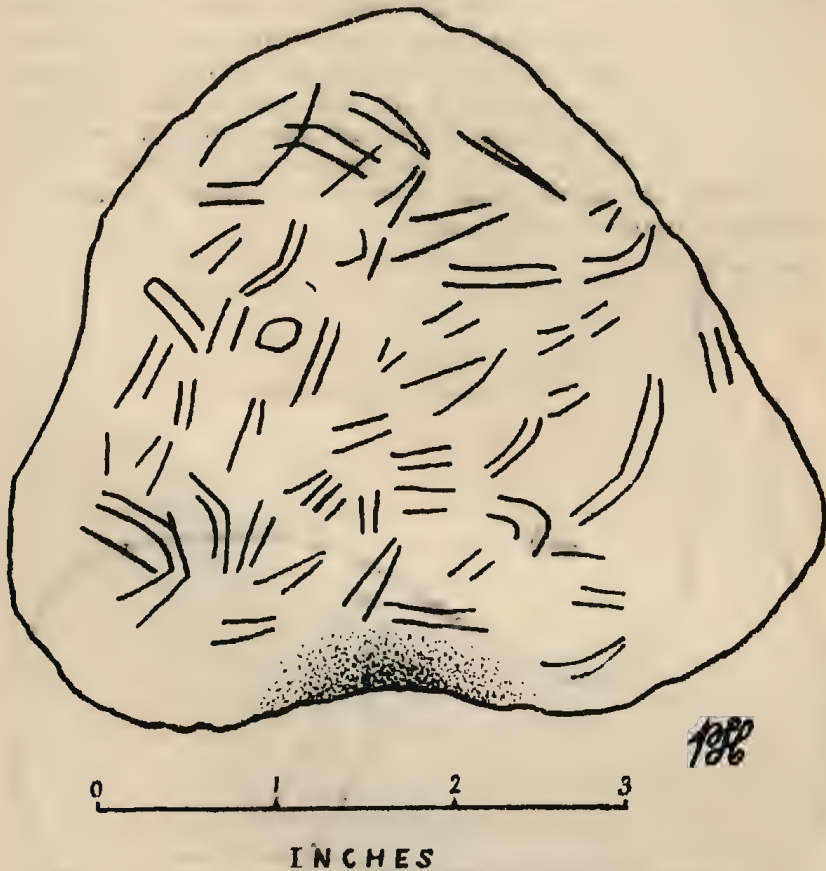


Fig. 2. Reniform slate from Normanville, South Australia.

form) and the engravings on the unweathered side, which are more numerous than on any specimen recorded or known to the writer. The engravings were found only on that side which was underneath when the stone was found, and hence was protected from erosion, which, however, was successful in obliterating the markings from the under surface for some distance from the margin. The engravings exhibit a marked tendency to occur in pairs.

AQUARISTS IN CAMP.

By Herbert M. Hale, Hon. Secretary S.A. Aquarium Society.

The tenth Annual Camp of the South Australian Aquarium Society was held at Finnis Creek from January 27th to 29th. Three tents were pitched near the large canoe-tree, not far from the main ford and alongside the fine, deep stream where large Callop, Trout and other edible fishes may be angled for. Conditions were not altogether propitious for collecting, for a day or two before 148 points of rain had fallen and the creeks were high and muddy. A few weeks before approximately 70 examples of the Purple-striped Gudgeon (*Mogurnda adspersus* or, as members better know it, *Krefftius adspersus*) had been taken from the long *Vallisneria*-covered stretch known by the sobriquet of "the *Krefftius* pool" by our aquarists, but on the occasion of the camp not a single specimen was taken in this place, although the collectors raked it assiduously from end to end with their long-handled nets. One example was taken, however, in the southern arm of the stream on Mr. Jolly's property. The spasmodic occurrence of this species is of considerable interest to aquarists, and investigations regarding the reasons for its sudden appearance and disappearance in certain haunts would be valuable. Pink-ear (*Melanotaenia nigrans*) were not seen owing to the muddy state of the water. Familiar friends such as the little Swamp-perch (*Nannoperca australis*), Gudgeons (*Philpnoton grandiceps* and *Carassius*) and Native Minnows (*Galaxias attenuatus* and *G. olidus*) were, as usual, present in abundance. Blackfish (*Gadopsis marmoratus*) were rather more in evidence than during former visits. A seine-net with a moderately small mesh was operated in the more open pools, but most of the small fry passed through the meshes and a couple of large Congollies (*Pseudaphritis urvillii*) constituted the main result of this method of collecting. It was suggested that a seine-net made of mosquito-netting or some such material would be more useful for obtaining small fishes on future excursions.

Some members indulged in angling, but the only tangible result was that several worms were soaked in the creek for long intervals and emerged intact.

The ubiquitous Yabbie (*Parachaeraps bicarinatus*), the River Prawn (*Palaeomon australis*) and the River Shrimp (*Paratya australiensis*) together with the extremely interesting Fresh-water Spider-crab (*Halicarcinus lacustris*) were amongst the crustaceans which appeared in the nets. Various aquatic insects were taken and it was noted that there was a preponderance of adults, and comparatively few were in process of metamorphosis, showing

that the summer cycle of many species was approaching completion. The native Giant *Vallisneria* was by far the most abundant of the water-plants; *Triglochin procera*, *Ottelia ovalifolia* *Potamogeton Tepperi* and *Myriophyllum elatinoides* were fairly plentiful.

It was noticed that in the evenings great numbers of bats frequent this part of the Finnis and one of the party, when investigating one of the red-gums near the camp during the day, dislodged about 130 examples from a low-hanging hollow bough.

Collecting was not confined to the Finnis, for excursions were made to various other waters within a ten-mile radius of the camp. On the large lake to the south numbers of water-birds—herons, ducks, shags and the like—were observed feeding upon the abundant fish, insects, snails and weed. Some members drove to Currency Creek and worked over part of the Black Swamp, which did not belie its name, the main portion being covered with odorous black slime. Numbers of Freshwater Turtles, or Murray Tortoises, were wallowing in this thick mud, and those who desired specimens of this Chelonian took advantage of the opportunity to secure them.

Apart from the more legitimate pursuit of fishes and other aquatic creatures, the male section of the camp caused some diversion on the last day by assisting to eject a large and unhandsome bull which had wandered into a large pasture adjoining the tents; assistance was rendered, however, only after members had been assured that the animal was comparatively docile.

Although few of the rarer fishes were taken, the visit well paid those participating in the camp. One of the main objects of the Society is the study of aquatic life in the broadest sense, and the observation of the Finnis under varying conditions has provided valuable object lessons. The campers greatly enjoyed their three days of out-of-doors freedom, and unanimously expressed regret that a longer time could not be spent in the locality.

The best thanks of the Society are due to Mr. Tucker and other residents, who kindly permitted the aquarists to camp and wander at will over their properties; Mr. Diener, the postmaster at Finnis, has also rendered much-appreciated assistance during all visits of the Society.

The next camp of the Society extends over the easter holidays (April 6th to 9th inclusive) and will likewise be held at the Finnis. Members of the Field Naturalists' Section are heartily invited to combine but as, unfortunately, the transport facilities, tent accommodation, etc. of the Aquarium Society are limited, they are asked to make independent arrangements.

THE PLANTS OF THE ENCOUNTER BAY DISTRICT
Notes on the Ecology (Continued*)

By J. B. Cleland, M.D.

XII. River Banks, passing into the vegetation lining creeks, often in rocky valleys and sometimes with waterfalls.

The vegetation of the creeks and "rivers" varies somewhat according to the size of the water-channel and the locality traversed by it. Some, such as the Hindmarsh and branches of the Inman, commence as upland creeks draining small swamps and then cut their way through the tops of hills, tumbling down rocky waterfalls of no great height. They then proceed through clay to alluvial soil which opens out eventually into alluvial flats, occupying wide valleys. As they approach the sea, they "dig in" to some extent so as to present more or less evident banks which control the flood-waters and in this state meet with the salt-water of high tides. The vegetation in consequence varies considerably from part to part. We have first of all, plants growing actually in the water (such as *Triglochin procera*, Bulrush, *Phragmites* (Reed) and *Ranunculus rivularis*) or in damp mud (*Villarsia*, water-cress, *Gratiola*, *Triglochin striata*, *Halorrhagis Brownii*) or in a tangle with roots more or less in water (*Blechnum capense*, *Carex pseudocyperus*, *Juncus holoschoenus*). Then come plants growing on the banks adjacent to the water, plants occupying the alluvial flats adjacent, those growing among the rocks where the watercourses descend to the lower levels, and those found in the broad creek or river beds as the sea is approached (as *Eucalyptus rostrata*).

Some species are rare and confined only to one or two situations. Thus the beautiful fern *Pteris tremula* only grows near the Lower Waterfall of the Hindmarsh (Mr. Ashby) and near a waterfall on the north side of the Inman, some several miles from its mouth. The type locality and only known habitat of *Corred calycina* are the rocks beside the Upper Waterfall of the Hindmarsh. On these falls a grass grows on the rocks in perennial moisture that has not yet been found in flower so as to be identified. *Leucopogon parviflorus* occurs as shrubs amongst the rocks in this situation, its usual site in this district being the sandhills. *Blechnum capense* grows in the Upper Hindmarsh and near the

*Vide Vol. VII, No. 2, Feb., 1926, p. 51.

Vol. VII, No. 3, May, 1926, p. 80.

Vol. VIII, No. 4, Aug. 1927, p. 53.

and Vol. IX., No. 1, Nov., 1927, p. 7.

Inman waterfall mentioned. In both these valleys *Scutellaria humilis* is abundant—it is a rare species in this State. *Sium latifolium* is found in the Upper Hindmarsh and in Hall's Creek. *Eucalyptus ovata* is found in Back Valley and in Hall's Creek, always near the water. *E. leucoxylon* is found as a grey-barked gum in the Back Valley flats. *E. ciminalis* grows on flats near the water in the Lower Inman and occupies sheltered hill-slopes higher up. *E. rostrata* is found in or near creek beds in the lower river areas. *Callistemon salignus* is in the bed of the upper reaches of the Hindmarsh.

Plants growing in the water itself or immediately adjacent thereto:—*Blechnum capense*, *Triglochin procera*, *T. striata*, *Typha angustifolia* (bulrush), *Phragmites communis* (reed), *Scirpus* (small, tufted), *Carex appressa*, *C. pseudocyperus*, *Juncus holoschoenus*, *Nasturtium officinale* (watercress), *Ranunculus ricularis*, *Halorrhagis Brownii* (*Meionectes*) (Inman waterfall, Hall's Creek, Upper Hindmarsh Creeks), *Hydrocotyle* sp., *Vilarsia exaltatum*, and *Gratiola peruviana*.

Plants on the banks and adjacent flats:—*Adiantum aethiopicum* (Maiden-hair fern), *Pteris tremula*, *Pteridium aquilinum*, *Imperata cylindrica* (blady grass), *Themeda triandra*, *Paspalum dilatatum*, *Microlaena stipoides* (abundant), *Polypogon monspeliensis*, *Calamagrostis filiformis*, *Holcus lanatus*, *Poa caespitosa*, *Cyperus vaginatus*, *Scirpus* (small, tufted), *S. nodosus*, *Gladium junceum*, *Lepidosperma exaltatum*, *L. concavum*, *Carex tereticaulis*, *Juncus planifolius*, *J. pallidus*, *J. pauciflorus*, *Dianella revoluta*, *Hakea rugosa*, *Banksia ornata*, *Rumex Brownii*, *Polygonum serrulatum*, *Bursaria spinosa*, *Billardiera cymosa*, *Rubus parvifolius*, *Acaena sanguisorbae*, *Acacia rhetinodes*, *A. verticillata*, *Geranium pilosum*, *Correa calycina* (Upper Waterfall, Hindmarsh R.), *Hibbertia stricta* var. *glabriuscula*, *Lythrum hyssopifolia*, *Leptospermum scoparium*, *L. pubescens* (abundant, in or near water), *Callistemon salignus* var. *australis* (Upper Hindmarsh in bed of river), *Melaleuca decussata* (on the flats occasionally), *Eucalyptus rostrata* (lower parts of the rivers), *E. ciminalis* (more retired from the water and on hill-slopes), *E. ovata* (in creek beds, Hall's Creek, Back Valley), *E. leucoxylon* (in flats), *Epilobium junceum* (Inman Waterfall), *E. pallidiflorum* (Upper Hindmarsh), *Halorrhagis teucroides*, *Apium australe*, *Sium latifolium* (in or near water, Upper Hindmarsh, Hall's Creek), *Astroloma humifusum*, *Leucopogon parviflorus*, *Acrotriche serrulata*, *Samolus repens* (banks of Back Valley Creek), *Anagallis*, *Erythraea Centaurium*, *Dichondra repens*, *Lycopus australis* (near water), *Scutellaria humilis* (Upper Hindmarsh Valley, waterfall off Inman, abundant), *Solanum nigrum*, *Physalis peruviana*

(Upper Hindmarsh), *Lobelia anceps* (near the water), *Wahlenbergia gracilis*, *Goodenia ovata*, *Olearia ramulosa*, *Siegesbeckia orientalis*, *Cotula coronopifolia* (near the water), *Gentipeda Cunninghamii*, *Gnaphalium luteo-album*, *Erechtites quadridentata*, *Microseris scapigera*, *Inula graveolens*, *Cirsium lanceolatum*, *Carduus tenuiflorus* and *Hypochaeris radicata*.

Plants growing amongst the boulders and rocks:—*Asplenium flabellifolium*, *Gymnogramme leptophylla*, *Pleurosorus rutifolius* (waterfall, Hindmarsh R.), *Crassula Sieberiana* and *Alchemilla arvensis*.

Plants growing on the steep and often rocky sides of the upper valleys:—*Xanthorrhoea semiplana*, *Psoralea patens* (Inman waterfall), *Dodonaea viscosa* (Inman Waterfall), *Nicotiana suaveolens*, *Plantago varia*, *Veronica Derwentia* (Inman Waterfall) and *Senecio hypoleucus* (Inman Waterfall).

XIII. Small Upland Swamps in or near glacial sands with a Flora resembling that of the Mt. Compass Area.

The tributaries of the creeks running into the Inman and Hindmarsh, especially those with a more or less permanent water supply, sometimes originate in small swamps whose vegetation resembles that of the Mt. Compass swamps, including a few species almost confined in this State to these areas. Such a swamp occurs in the upper part of Back Valley. There is a dense vegetation, except in the centre, consisting of a broad-leaved *Lepidosperma*, probably *L. concavum*, *Sprengelia incarnata* and *Leptospermum scoparium* as dominants, at the bases of which nestle smaller plants such as the fern *Lindsaya linearis*, *Boronia palustris*, *Cladium acutum*, *Schoenus n. sp.*, the two *Patersonias*, *Halorrhagis teucrioides*, *Lepyrodia n. sp.*, *Lobelia anceps* and *Villarsia*. A group of the orchid *Cryptostylis longifolia*, in flower in January, grew through this covering, as did occasional plants of *Viminaria denudata* and *Goodenia ovata*. Where water was actually still present and practically permanent *Gahnia prittacorum* and *Acacia rhetinodes* formed a taller covering. Here in the thick peaty mud or water, grew *Utricularia dichotoma*, *U. lateriflora*, *Schizaea fistulosa* (Comb Fern, rare), *Centrolepis fascicularis*, the hairy prostrate *Leucopogon hirsutus*, *Patersonia longiscapa*, *Hypolaena lateriflora* (forming a tangled curled mass), *Xyris operculata*, *Drosera binata* and the prostrate *Holorrhagis micrantha* (the flowers were distinctly fragrant, smelling like those of one of the love-grasses *Eragrostis*). Other plants present in small numbers consisted of *Burchardia umbellata*, *Juncus caes-*

piticius, *Cassythia glabella*, *Marianthus bignoniaceus*, *Acacia vericillata*, *Melaleuca decussata* and a *Leucopogon*. The total number of species found was 30.

XIV. Lowland Swamps, often near the Sea.

This section need not detain us long. Only one area, the lower end of Waitpinga Creek, now comes within this category and at the present time (January, 1928) the swamp part is dry, only a broad bit of "river" remaining, dammed back by the shifting sand-dunes blocking the exit of the water. The flat will become swampy again when, as at present, sufficient sand blocks the outlet, and on the other hand winter rains have been heavy enough to impound a sufficiency of water. At present, most of the swampy flat is quite bare (representing the originally deeper portion). This is edged by an extensive area covered by the closely appressed *Mimulus repens* in flower (January). On the landward side of this are many young plants of *Chenopodium glaucum*. *Cyperus vaginatus* fringes the *Mimulus* zone with some of the rush *Juncus maritimus* var. *australiensis*. Landward again, in places where the soil is more sandy, is a zone of *Scirpus nodosus*. The grass *Distichlis spicata* is in parts abundant in subsaline areas, often amongst the sedges, *Sporobolus virginicus* being less abundant. In addition, mostly outside the *Mimulus* zone, which is in great part pure, and near the river bank, are occasional plants of the grasses *Polypogon monspeliensis*, *Calamagrostis filiformis*, and *Hordeum*, of a large dock (*Rumex*), *Polygonum serrulatum*, Pimpernel (*Anagallis*), *Apium australe* and *Cotula coronopifolia*. On damp banks *Triglochin striata* is found with the large *T. procera* in the water itself. In the "river" is an abundance of *Potamogeton pectinatus* round the edge.

A HOLIDAY ON CORAL ISLANDS.

W. J. Kimber.

As a student of marine life, for many years my holidays have been usually spent at the seaside in many parts of South Australia where the reefs have been my happy hunting grounds, yielding many treasures for my collection. A desire to search on other parts of our immense shore-line has at last been gratified, as in November last I was able, with two other South Australians to join an expedition, which had been organised by Mr. E. F. Pollock, of Sydney, to visit the Bunker and Capricorn Groups of

islands at the Southern end of that wonder of the world, the Great Barrier Reef, which extends for over one thousand miles off the east coast of Australia. There is a great variety in the vast number of islands ranging from mountainous ones to those entirely composed of coral, and others which, in process of growing showed only when the tide was low. The Barrier reef has an area of quite 80,000 square miles, the islands, reefs, and sea absolutely teeming with life, not only of scientific interest but of great commercial value. Here there is much wealth waiting for enterprising Australians to exploit, and although pearl shell and pearls, trochus shell, beche-de-mer, and turtle for soup and shell, have been taken for many years, there is a vast area still awaiting commercial enterprise. A few scientists have paid short visits and have been well repaid by examining the marine life which exists here in richness unequalled in any part of the world. To tell you something about the coral islands and the strange creatures living in the surrounding waters is my pleasing task, and my great regret is that my descriptive powers are so inadequate.

There were about thirty in the party, including nine ladies, when we left Bundaberg, 200 miles north of Brisbane on the 16th November in three sailing boats fitted with oil engines. The distance to our first camp on Lady Musgrave Island was 60 miles, and here we spent six days. This island with Hoskyn and Fairfax Islands and three large separate reefs compose the Bunker Group. It is thought that the whole of the Barrier Reef is a sunken mountain range, the tops rising above the surface, in some places forming well defined islands. Other parts of the range may be submerged only a few fathoms and on them the coral polyp has through the ages been busy building up that structure in comparison with which the mightiest work of human beings is puny indeed! A few words about this polyp, or coral "insect" as it is often erroneously called, may be of interest. It belongs to the branch of the animal kingdom called *Coelenterata* (Hollow-bodied animals) to which also belong *Hydzoa*, *Medusa* (Jelly fish), *Actinozoa* (Sea Anemones), *Alcyonaria* (Sea Mats and pens), and *Gorgonia* (Sea fans), all of which are of great interest and many of surpassing beauty. The coral polyp is much like a tiny sea anemone that has the power of secreting lime which it takes in with its food captured by its flower-like tentacles. There seem to be three principal varieties of coral polyps engaged in the colossal task of reef building, the perforate, the imperforate, and the solitary. The perforate corals we saw were best described as being round lumps often a foot in diameter and of a beautiful red color which is very lasting. This colony of polyps makes

tubes which contain the jelly like animal at wonderfully regular intervals protruding its starlike tentacles like a richly colored, animated daisy, quite half an inch in diameter. On being touched, or as the tide falls, the whole of the animal disappears in the tubes and on dislodging the lump a slimy matter exudes which can only be got rid of by boiling and then thoroughly washing. (This has to be done with all living coral specimens, otherwise the smell from the decaying bodies of thousands of polyps is very objectionable). This "organ-pipe" coral was the only colored variety we saw, and, unlike the red coral of the Mediterranean, is of no commercial value, but certainly is very beautiful. There was a great variety in the shape of the coral made by the perforate builders, one most wonderful being the "Stag-horn," like the branching antlers of a stag. We regretted that they were so brittle and difficult to transport. We found large examples of "Brain Coral," so called because the polyps build a structure arranged with trenches like the convolutions of a brain: in these the canals of communication are at the surface and the coral very solid. The solitary, or "Mushroom Coral" is very distinct in its structure and is the work of one polyp which forms a flat plate resembling the lower surface of a mushroom but it is perfectly white. How the regular, sharp, radiating septa are made by a slimy blob of jelly is certainly beyond comprehension. When one peeps into a pool of transparent water surrounded by coral of many species, seeing the various beautifully colored flower-like polyps extended from their tiny holes, taking in their food, trying to think what that food was, one realised how surpassingly beautiful and mysterious are the works of the Creator! In these pools, too, were other creatures of species we had never seen before, very large sea anemones, a relation of the coral polyp, with its body distended with water, its tentacles extended like the petals of the flower after which it is named. Woe betide the tiny fish or crustacean which touches those beautiful but cruel tentacles, as they are quickly paralysed by stings and drawn in to the body of the enemy. Here also were many species of starfish and sea urchins, beche-de-mer, molluscs, crustaceans, and worms in countless number inhabiting every crevice of the coral. We wondered what the food could be which satisfied the millions of mouths, as the unaided eye could see nothing other than the creatures mentioned through the transparent water. Just as our minds are utterly unable to comprehend the distance of the stars and their numbers, so here, as we think of the extent of the Reef, the makers of it, and the animal life within its borders, its boundlessness appals us!

Let us now try to explain how these coral islands were formed. Coral is almost pure carbonate of lime, and very brittle, as we often found as we attempted to walk on top of dead coral reefs, when our feet would crash through. Pounded by the cyclonic storms blocks of coral are torn off and ground into coarse sand at shallow depths and being constantly added to, appear above the surface at low tide. We saw several of these islands in the making as we sailed about the Groups and wondered how long it would be before they became like those we camped on. Gradually sand and coral blocks are cast higher up till at last the highest tide does not submerge them, drift wood and marine growth decay, sea birds nest there and the scanty soil is enriched by their excreta. Seeds of the *Pisonia*, *Panadanus Palm* and *Casuarina*, which can withstand long immersion in sea water and be thrown up and being watered by copious rains take root and bind the sifting sand. All the trees on the islands are very succulent and pithy, they grow very quickly and as quickly decay. We were surprised to see steep beaches composed of large worn consolidated coral intermingled with big clam and other shells and right in the middle of some of the islands we found the same kind of blocks and shells, such as we collected alive on the reefs. Not a rock other than that made of coral did we see, proving to us that the tiny coral polyp had worked through many years to lay the foundations of these tiny new parts of the British Empire. The islands that are established are well covered with vegetation, some of the *Pisonias* being 40 ft. high. They are easily seen when approaching, but the reefs and sand bars which are so numerous are a source of great danger and travelling among them at night is quite out of the question.

Lady Musgrave Island is several hundred acres in extent, and is well wooded so far as trees are concerned but there is no undergrowth as there are about 150 goats on it and they have eaten every green leaf within their reach. There is no water and very little food and yet the goats were in fair condition. When a leaf fell there was a rush by the goats to get it, and as they are succulent they must thus provide food and drink. Very few of our party had been on a coral island before, but we all knew that November had been chosen for the visit because in that month the sea birds are nesting and the great turtles come ashore to lay their eggs. They were our close (a little too close!) friends for 26 days, and of them and some of the marine wonders we saw I will tell later.

To be continued.

SOUTH AUSTRALIAN SHELL COLLECTOR'S CLUB.

This Club held its first meeting for the new year on Monday evening, February 6th. Twenty-one members were present, and the enthusiastic interest displayed foreshadowed a further useful session in 1928.

The evening was of an informal nature, most of the time being taken up with the examination and identification of specimens collected during recess. Apparently many desirable "shell" fish are still in the sea, as quite a goodly number were tabled, taken from widely separated South Australian beaches.

It is encouraging to the younger collector to know that the older and more experienced conchologists hold the opinion that this interesting branch of natural science is still somewhat of an "open book" in this State. Although the commoner shells met with on our shores have already been thoroughly described, the vast region of deeper waters around our coastline has been only partially examined, and still holds numerous molluscan forms not yet collected or described. Most familiar local shells met with have been carefully tabulated and placed in their proper family relationship, notably by Sir Jos. Verco, but still much work remains to be done.

Shells collected by Club members during the Christmas holidays included:—a large fragment of *Turbo jourdani*, our premier univalve in regard to size, from Yorke Peninsula, showing that its habitat extends far from its metropolis, St. Francis Island, Australian Bight; *Conus seagravei* (Gatliff), a rare cone for this State; and a splendid live specimen of *Ericusa fulgetrum*, also from Yorke Peninsula (by Mr. Saunders).

Mrs. L. Elliott, who has a wide knowledge of South Australian beaches, showed nice specimens of *Donax brazieri*, and *D. cardioides*, from Yorke Peninsula. Revd. H. Gunter collected some rare specimens from dredge siftings at Outer Harbor, as yet undescribed.

Mr. F. Godfrey showed several perfect specimens of Fossil *Echinoderms* and *Terebratulina* from Kangaroo Island.

Miss V. Taylor, a large array of *Loricates* from Marino Rocks.

Miss Vohr, beautiful examples of *Antigona lagopus* and *A. gallinula*.

Miss M. Roeger, from vicinity of Port Arthur, Tasmania, a set of characteristic species, including a large and beautifully marked *Scaphella undulata*.

Mr. Trigg, living specimen of *Lutraria rhynchaena* and *Bassina disjecta*, from the sand flats at Outer Harbor.

Mrs. Pearce had some first-class specimens of *Cypraea angustata* obtained from a West Coast beach.

Mr. Kimber and Mr. Williams exhibited a large series of specimens obtained by them from the Great Barrier Reef Queensland, recently, including the exceedingly rare *Astridium aureoleum* (of which there are only three known specimens), and *Tonna*, *Cymbium diadema*, 8 varieties of *Cypraea*, *Strombus*, *Cerithium*, *Voluta*, *Perna*, *Tellina*.

F. TRIGG,

February, 1928.

Hon. Sec. S.A. Shell Collectors' Club.

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NATIVE ROCK SHELTERS AT OENPELLI, VAN DIEMEN GULF, NORTH AUSTRALIA.

By Norman B. Tindale.

Through the kindness of Mr. W. R. Penniford, now of Port Darwin, it is possible to place on record some notes on rock shelters at Oenpelli.

On the sides of a sandstone hill overlooking the East Alligator River, about a mile to the eastward from the former Government Experimental Station (now converted into an aborigines' reserve) there are several caves and rock-shelters used by the natives of the Kakadu tribe as occasional dwellings and as repositories for the bones of their dead.

The first of these shelters to be noticed has been weathered out of the horizontally bedded stone and forms a chamber six feet long with an overhang of some eight feet and the maximum height of four feet.

As far back as the present generation of natives can remember, it has been used as a wet season camping place. The floor is built up of layers of ashes and debris, resulting from their occupation. Every portion of the roof is covered with paintings. Red, white and yellow are used, one layer superimposed upon several earlier layers in such a way that the final effects are very complex. Figures 1 and 2 each show a part of the roof approximately six feet long by three feet wide. Most of the figures are representations of the barramunda fish (*Osteoglossum leichhardti*) but turtles, mammals, and other creatures are depicted occasionally.

In Figure 1 the chief painting is that of a barramunda, superimposed on several earlier representations of the same creature. beside it there is a peculiar figure (in solid white) which reminds

one of similar designs depicted by men of the Walmbariya tribe at Bathurst Head, Queensland, and by them intended as a representation of the native honey bee. This creature provides one of their chief foods during a portion of the year.

The internal anatomy of many of the creatures is figured in detail. The back-bone is usually conspicuous and prominence is given also to the liver and fat-bodies. Since the natives of all the tribes of Arnhem Land suffer from chronic "fat-hunger", such sources of supply are of great importance to them. It will be noticed that the figures are similar in technique to those painted by Kakadu men on sheets of bark and illustrated by Spencer.(1).

In a second shelter near the first there are many paintings of anthropomorphic forms, some of which are similar to the figures of *mormo* given by Spencer.

On the same hill, there is a third shelter beneath a projecting sandstone block. The low entrance is marked by a branched stick five feet high, which is supported by a mound of pebbles. It has some unascertained ceremonial significance.

The walls and roof are covered with figures of hands, each one outlined in white pipe-clay. Scattered about the floor are the remains of many human beings. Among them several dozen complete skulls and fragments of many others were noticed. Some of the bones still remained in the stringy-bark parcels and string-and-grass dilly bags in which they had been carried to the shelter. Most of the containers, however, were old and perishing. Some were of large size (up to two feet in length and a foot in width). Not all contained human remains; one, for example, containing only a single ball of native beeswax (about two inches in diameter). The best preserved of the skulls was collected and has been presented to the Museum.

Like several other tribes in Arnhem Land (as for example the Allawa and Marsa peoples of the Roper River), the Kakadu people wrap the body in stringy or paper-bark and place it in the fork of a tree. After the flesh has decayed and the concluding ceremonies incidental to the mourning period have been performed, the bones are gathered in a painted bark-bag or other receptacle and deposited in one of several shelters and caves of which the above mentioned is the principal one. No trouble is taken to preserve the identity of the remains after they have been placed amongst the bones of the former tribesmen.

(1) Spencer, Sir Baldwin, Natives tribes of the Northern Territory, 1914, p. 432, figs. 79—92.

Plate No. 1.



Fig. I. A barramunda fish.



Fig. II. Paintings on roof of cave at Oenpelli.

DANGEROUS AUSTRALIAN SPIDERS.

It is usually considered that few Australian spiders are dangerous to man as the greater number do not secrete sufficient venom. However, it is well known that there are some exceptions. The best known venomous species is the red-backed spider, *Lactrodectus hasseltii*, which from its being often found among rubbish about man's dwellings is particularly dangerous.

A recent case in New South Wales, where a baby died after being bitten by a spider, afterwards identified as a trap-door spider *Atrax robustus*, shows that we should regard many other spiders with suspicion and handle them with great care. Following on this case, many specimens were sent in and as a result of the investigations made another trap-door spider, *Atrax formidabilis*, is also to be regarded as harmful to man.

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OUR EXCHANGES.

"The Transactions and Proceedings of the Royal Society of South Australia." The current volume (LI.) for 1927, is one of very great interest to our members, whether they are experts in some particular branch of the Natural Sciences or have a general interest in the study of nature. Dr. Rogers contributes an important paper on the Orchids of Australia. Messrs. Tindale and Sheard write on the Aboriginal Rock Paintings on the South Para River. Dr. Cleland collaborates with Mr. Black in a comprehensive enumeration of the Vascular Plants of Kangaroo Island and Dr. Cleland contributes a paper on Fungi as well as a study of the Aborigines at Oodnadatta and Alice Springs. Mr. Lea describes new species of Curculio. Prof T. Harvey Johnston publishes a paper on New Trematodes from an Australian Siluroid.

One of the most important papers is a comprehensive study of the physiography of South Australia by Dr. Fenner. The title—"Adelaide, South Australia: A Study in Human Geography" gives but a hint of the wealth of information and suggestion contained in this historic, geographic, physiographic, and economic study of the site and establishment of our capital city and its relation to the rest of the State. Every member of the Society would find much profit and pleasure in the study of this comprehensive and brilliant paper. If space permit, the "Naturalist" will contain in a future number some extracts. Its original diagrams and maps are a feature of the paper. Miss Macklin contributes a paper in which she discusses the classification of our Casuarinas. Papers by Messrs. Waite and Hale describe various branches of the natural history of Kangaroo Island.

Prof. Howchin continues his valuable papers on the occurrences of Sturtian Tillite near Eden, and in the Midlands (Kapunda, etc.). Valuable papers on Geological subjects are contributed by Sir Douglas Mawson, Prof. David, and Mr. C. T. Madigan.

Space will not permit of more extended reference but enough has been written to show those of our members who are not also members of the Royal Society that the annual volume alone is excellent value for the modest annual subscription of one guinea.

1. "Society for the Preservation of the Fauna of the Empire." The Society desires to enlist the sympathies of the general public in Great Britain and in the overseas Dominions and Dependencies and is established to assist in educating it to realise its responsibility with regard to the heritage of wild life with which Nature has endowed each country.

2. "The Australian Forestry Journal". September to January numbers

3. "Annual Report of the Woods and Forests Department for the year ended June 30th, 1927." A most encouraging feature of the Report is the fact that during recent years the planted area has been very greatly increased.

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BIRDS OF THE NATIONAL PARK.

By J. Sutton.

Painted Quail (*Turnix varia*), Common Bronzewing (*Phaps chalcoptera*), Little Grebe (*Podiceps ruficollis*), Banded Plover (*Zonifer tricolor*), Wedge-tailed Eagle (*Uroaetus audax*), Brown Hawk (*Falco berigora*), Nankeen Kestrel (*Falco cenchroides*), Boobook Owl (*Ninox boobook*), Blue Mountain Lorikeet (*Trichoglossus moluccanus*), Musk Lorikeet (*Glossopsitta concinna*), aide Rosella (*Platycercus adelaidae*), Red-backed Parrot (*Pse-Purple-crowned Lorikeet* (*Glossopsitta porphyrocephala*), Adelphotus haematonotus), Swift Parrot (*Lathamus discolor*), Laughing Kookaburra (*Dacelo gigas*), Sacred Kingfisher (*Halcyon sanctus*), Pallid Cuckoo (*Cuculus pallidus*), Fan-tailed Cuckoo (*Cacomantis flabelliformis*), Horsefield Bronze-Cuckoo (*Chalcites basalis*), Welcome Swallow (*Hirundo neoxena*), Tree Martin (*Hylochelidon nigricans*), Grey Fantail (*Rhipidura flabellifera*), Willie Wagtail (*Rhipidura leucophrys*), Restless Flycatcher (*Scisura inquieta*), Jacky Winter (*Microeca fascians*), Scarlet Robin (*Petroica multicolor*), Hooded Robin (*Melanodryas cucullata*), Golden Whistler (*Pachycephala pectoralis*), Rufous Whistler (*Pachycephala rufiventris*), Grey Shrike-Thrush (*Colluricincla*

harmonica), Magpie-Lark (*Grallina cyanoleuca*), Eastern Shrike-Tit (*Falcunculus frontatus*), Black-faced Cuckoo-Shrike (*Coracina novae-hollandiae*), White-winged Triller (*Lalage tricolor*), White-browed Babbler (*Pomatostomus superciliosus*), Australian Ground-Thrush (*Oreocincla lunulata*), Striated Thornbill (*Acanthiza lineata*), Buff-tailed Thornbill (*Acanthiza reguloides*), Yellow-tailed Thornbill (*Acanthiza chrysorrhoa*), Superb Blue Wren (*Malurus cyaneus*), Masked Wood-Swallow (*Artamus personatus*), White-browed Wood-Swallow (*Artamus superciliosus*), Dusky Wood-Swallow (*Artamus cyanopterus*), Black-capped Sittella (*Neositta pileata*), Brown Tree-creeper (*Climacteris picumnus*), White-throated Tree-creeper (*Climacteris leucophaea*), Mistle-toe Bird (*Dicaeum hirundinaceum*), Spotted Pardalote (*Pardalotus xanthopygus*), Red-tipped Pardalote (*Pardalotus ornatus*), Grey-backed Silvereye (*Zosterops halmaturina*), White-naped Honeyeater (*Melithreptus lunatus*), Black-chinned Honeyeater (*Melithreptus gularis*), Brown-headed Honeyeater (*Helithreptus brevirostris*), Eastern Spinebill (*Acanthorhynchus tenuirostris*), Tawny-crowned Honeyeater (*Gliciphila melanops*), Regent Honeyeater (*Zanthoniza phrygia*), Yellow-faced Honeyeater (*Meliphaga chrysops*), White-plumed Honeyeater (*Meliphaga penicillata*), Crescent Honeyeater (*Phylidonyris pyrrhoptera*), Yellow-winged Honeyeater (*Meliornis novae-hollandiae*), Noisy Miner (*Myzantha melanocephala*), Little Wattle-Bird (*Anthochaera chrysoptera*), Red Wattle-Bird (*Anthochaera carunculata*), Diamond Firetail (*Zonaeginthus guttatus*), Red-browed Finch (*Aegintha temporalis*), Australian Crow (*Corvus cecillae*), White-backed Magpie (*Gymnorhina hypoleuca*).

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The appointment of Prof. T. G. B. Osborn, D.Sc. to the position of Professor of Botany at Sydney University removes one of our most enthusiastic workers. Prof. Osborn and Mrs. Osborn have helped the Section most cheerfully and we join in wishing them happiness in their new sphere.

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In November, Mr. C. T. White, Government Botanist of Queensland, paid us a visit and gave members a very fine address on Forestry in Queensland and New Guinea.

THE CORAL ISLES.

Far are those isles of summertime,
So slowly formed at God's decree,
Who willed that fairy-land should climb
To gem the surface of the sea.

For far and wide the ocean rolled
Where He had willed the isles should stand,
No land in sight for leagues untold,
Yet from the sea grew fairy-land.

If God had willed, the earthquake's shock
Would from the vasty depths have raised
A tow'ring mass of earth and rock,
This would have done and God have praised.

His choice fell on a creature small,
Which therein should a rampart make.
A creature small, and yet its wall
No storm, nor wave, can ever break.

The ages go, for aeons still
The wall is rising thro' the seas,
And still the worker has the will
To compass God's expectancies.

At long, long length the fastness rose
Above the tumult of the wave,
Nor heeds the storming combers' blows,
Nor trembles when the tempests rave.

And then, from far off oceans drift,
Some floating wreckage finds a rest,
An anchorage in the corals' rift,
Wherein the sea-bird builds a nest.

Perchance, in time, a seed shall fall
From wand'ring bird from distant land.
A nut, from stately palm tree tall,
Shall, sea-tossed, find a welcome strand.

'Tis soon with verdure overgrown,
Thro' fav'ring rain and tropic heat.
The sea must now a conqueror own,
And God's dream-island is complete.

J. T. Cunningham, Alberton.

January, 1928.



The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide

May, 1928

VOL. IX.

FNS

No. 3

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The authors of papers are responsible for the facts recorded and opinions expressed.

Address of the Section: C/o Royal Society's Rooms, Institute Building, North Terrace, Adelaide.

Published Quarterly

Single Copy NINEPENCE

Obtainable from Cole's Book Arcade, No. 14 Rundle Street, Adelaide.

Printed & Bound by Print, Collier, Ltd., Adelaide, Phone C. 1541

The South Australian Naturalist.

Vol. IX.

MAY, 1928.

No. 3

ADELAIDE, SOUTH AUSTRALIA: A STUDY IN HUMAN GEOGRAPHY

By Charles Fenner, D.Sc.

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In the February number of "The South Australian Naturalist" we published a short review of the above. For this number the Editor of the Transactions of the Royal Society has kindly allowed us to publish a section of the paper, illustrated by a block lent by the Royal Society.

Factors Determining the City Site.

The successive factors in the selection of the site of Adelaide were:—

- (i.) Gulf St. Vincent (shelter and central position).
- (ii.) The Adelaide Plains (wide fertile spaces).
- (iii.) The Port River Estuary (secure harbour).
- (iv.) The Torrens River (supply of fresh water).
- (v.) The Para Block (high level ground).

Colonel Light has set out the reasons that led him to favour the eastern shore of Gulf St. Vincent in preference to all other available sites, having in view the main factors of harbour facilities, fertile soil, water supply, and access to the Murray Valley. Price (ref. 1, 2) has shown that Sturt, before this, had expressed favour towards the eastern shores of Gulf St. Vincent. In this, Sturt and Light showed that topographic knowledge and instinct for which both men have already been noted.

The next factor was to discover a harbour for the sheltering of the immigrant ships that were following so closely. Here Light's observations and information led him to favour Barker's Inlet ("Sixteen Mile Creek"), discovered in 1831, mostly referred to by Light as "Jones' Harbour" (because of Jones' account of 1833). The fertile and beautiful plains of Adelaide all the more strongly inclined Light to find a harbour in their vicinity—fertile spaces being first among all the factors of human geography.

The search proved an elusive undertaking, on account of the peculiar physiographic features of the lower delta of the Torrens, and the fact that the chief arm runs parallel, and not normal to the coast. The harbour was ultimately discovered, and, setting aside the vicissitudes of the search for the best site within the inner port, this decision formed the second step in the selection of the site of the "first city."

The next requirements were fresh water and good ground for a settlement. The lower deltaic plains were rejected for obvious and excellent reasons. The higher deltaic areas (above the 40-foot contour) were considered, were favoured by Governor Hindmarsh, but were ultimately rejected by Light because of the signs of occasional flooding. The Torrens promised to provide a water supply adequate for all requirements for some time, therefore it was decided that the settlement should lie along the river. A good city site should have some eminence and freedom from floods; thus the Para Fault Block came into the discussion. The site must also be as near as possible to the harbour.

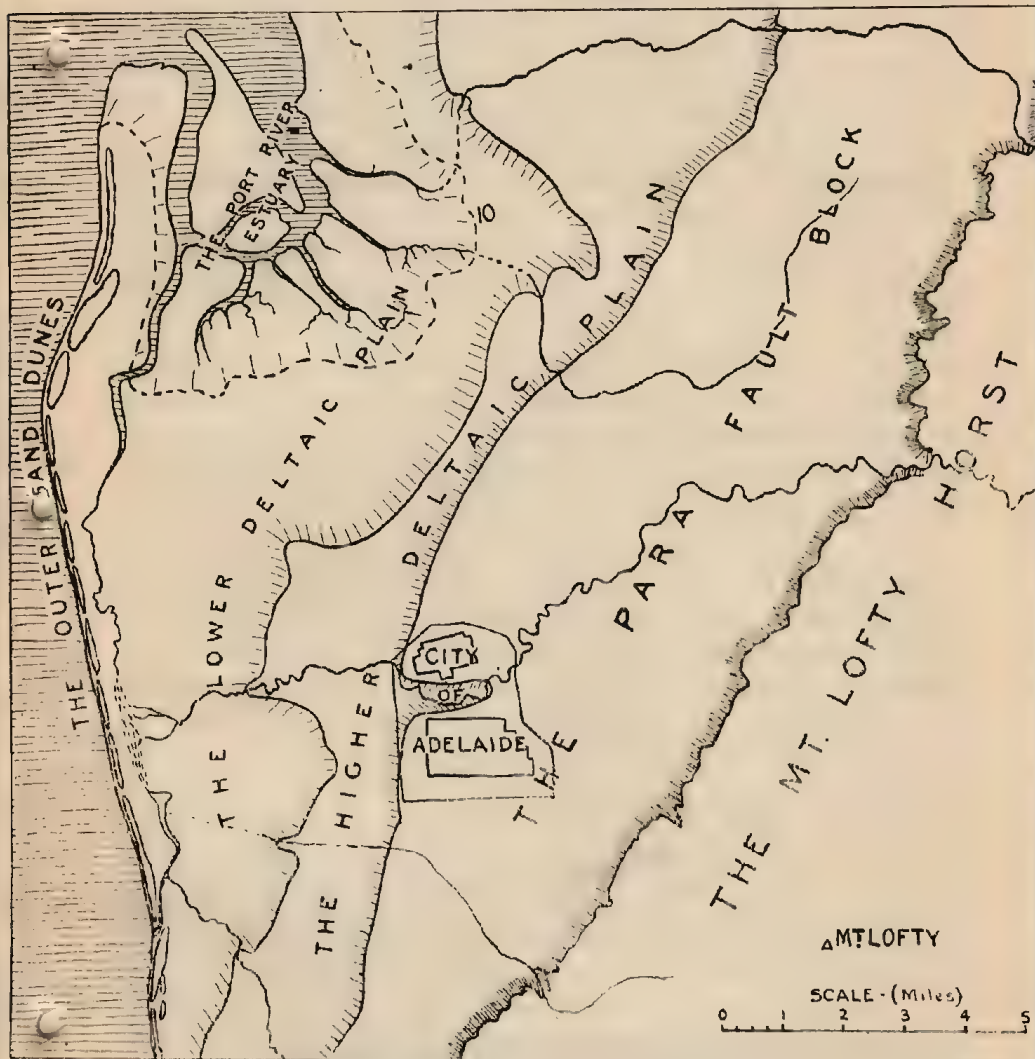
For all these reasons it came about that the point nearest the harbour, where the uplifted western edge of the Para Fault Block is intersected by the Torrens Valley, was the determining point in the selection of the site of Adelaide proper, and here, on February 11, 1837, somewhere about the corner now occupied by the Newmarket Hotel, the survey of Adelaide was begun.

This place, called "Newmarket Hill", is a slight rise (30-40 feet), but it is a most significant rise; it is the southward continuation of the scarp that appears across the valley in Montefiore Hill. It covers the position of a great north-south fault, the Para Fault, in which the adjoining western block (the Croydon Shelf) is thrown down some two thousand feet (ref. 3). On the Adelaide Plains, Nature provided almost ideal geographical conditions for the site of a city; Colonel Light wisely interpreted those conditions.

Factors influencing the Plan of the City.—A variety of theories has been propounded and many strange stories told about the reasons for Adelaide being laid out as it is. Some of these accounts appear to be based on the quite unnecessary assumption that Light must have "copied" his plan from some other city. Others, possibly emphasising the fact that Light was a soldier, and forgetting that he was also a surveyor (and, as we know, an intelligent town-planner), have striven to see in the plan hidden ideas regarding fortifications, defences, range of guns, and many other matters for which we have no evidence. In this connection, the "stepped" arrangement of East Terrace has provided material for a number of theories.

It is desired to show, and to establish from Light's own words, that he designed the city to suit the physiographic conditions of the site, and that no military or other external considerations entered into the matter. This is exactly the attitude of mind with which we should have expected a trained and capable man to enter on his job.

The first important decision was to build the city in two parts, using the high level land (average height 140 feet above sea level) on both banks of the river, with the larger portion on the southern side (see map). This was determined by the lay of the land (consult military or hydraulic engineer's contour



maps). The Para Fault Scarp being the western boundary, the angle at which the river came down from the north-east left a smaller elevated area north of the river than was available on the south. Light's first scheme, as shown in his map of February 7, 1837 (reproduced in Gill's "Biographical Sketch of Light"), was to make the smaller rectangular North Adelaide area parallel with the southern larger rectangular area of South Adelaide.

When the survey got down to details the finer points of the relief of the area naturally asserted themselves. North Adelaide was brought closer to the river, and tilted to one side to suit the contours of the country. Considerable additions (towards Pennington Terrace and Lower North Adelaide) were also made on the sunny east-facing slopes of the Torrens Valley. This brought the north-western corner of North Adelaide along the sloping face of the fault scarp; consequently Mills Terrace was "stepped off," as we know it now, by leaving out some of the blocks so that it would fit the contours.

The north-eastern corner of the proposed South Adelaide rectangle was also found to lie along a valley (the small valley that runs through the East Park Lands into the Botanic Gardens), and here also some blocks had to be left out, and East Terrace is thus "stepped off" to suit the contour of the site. The important part played by the contours in this lay-out may further be gauged by the emphasis placed on the shading of the more important slopes in Light's first detailed map of Adelaide, the one that shows the numbered acres (ordered by the House of Commons to be printed, January 26, 1838).

In the interior arrangement of streets and squares, and the setting aside of Park Lands, it is, of course reasonable to assume that memories of such cities as Catania and others played a part (*vide* "City of Adelaide Year Book, 1927," p. 232). But there can be no doubt that the general plan of the present city of Adelaide was determined by a wise and thoughtful man seeking to make the best use of the geographical advantages of the site selected.

He has told us that he moved his camp to the site of Adelaide on January 3, 1837, so as to be near his work, and then wrote in his "Journal" (p. 43):—"From this time to January 11 I was employed in looking repeatedly over the ground, and devising in my own mind the best method of laying out the town according to the course of the river and the nature of the ground."

There is possibly no other city in the world, of similar importance, where the various geographical factors determining the site can be so easily recognised and so readily confirmed from the word of the founders themselves.

1. A. Grenfell Price,—"The Settlement of South Australia." A.A.A.S., Vol. XVII, Adelaide, 1924, p. 439.
2. A. Grenfell Price,—"Geographical Problems of Early South Australia." Proc. Roy. Geog. Soc., S. Aust., Vol. XXV, p. 57.
3. Walter Howchin,—"The Evolution of the Physiographical Features of South Australia." A.A.A.S., Vol. XIV., Melb., 1913, p. 148,

THE PLANTS OF THE ENCOUNTER BAY DISTRICT
NOTES ON THE ECOLOGY (Continued*)

By J. B. Cleland, M.D.

Vide Vol. VII, No. 2, Feb., 1926, p. 51.

Vol. VIII, No. 4, Aug., 1927, p. 53.

Vol. IX, No. 1, Nov., 1927, p. 7.

Vol. IX, No. 2, Feb., 1928, p. 27.

- VI. The Country Behind the Cliffs towards Waitpinga, rocky and gravelly with a sandy clay, the soil too thin and stony to lead to clearing and replacement by grass, and so still covered with wealth of Eucalypts of mallee formation, low shrubs, etc.

The above describes briefly this rough country forming a narrow belt landwards from the cliff edge and stretching from a little beyond King's Point to Newland's Head. It is intersected by occasional deep rocky gullies down which small streams run after rain to the high precipitous sea-cliffs. In places it is very difficult and tedious to traverse owing to the closely-set bushes, breast-high to over one's head, and stony out-crops. The list appended shows that grasses rarely grow here. A few xerophytic cyperaceous plants are met with, the most interesting being *Schoenus Tepperi* (usually eaten down by rabbits or sheep where these have access and so not yet found in the flowering state) which forms patches often of some yards in extent of dense harsh sward an inch or so high, preventing erosion from rain as shown by the sward-covered portion being raised an inch or so above the bare ground between the patches. The most characteristic plants are harsh-leaved Proteaceae (*Grevillea ilicifolia* only grows here in this district), dwarf Casuarinas and a wealth of mallee-like Eucalypts. Nearly all the Eucalypts with this habit in the Encounter Bay district may be found in this area. Several plants of the Kangaroo Island oil-mallee, *E. cneorifolia*, have been found here, a relic of the old land-connection between the two localities. Epacrids also form a fairly conspicuous feature.

The following comprise the more important plants met with in this area proper:—*Cheilanthes tenuifolia*, *Schoenus Tepperi* (forming a dense sward an inch or so high, with bare ground between), *Lepidosperma concavum*, *L.* (narrow leaf), *L. carphoides*, *Lomandra dura*, *L. juncea*, *Dianella revoluta*, *Xanthorrhoea semiplana*, the orchid *Orthoceras strictum*, dwarf Casuarina, *Parietaria debilis* (in protected situations), *Isopogon ceratophyllus*, *Hakea rostrata*, *H. rugosa*, *Grevillea ilicifolia*, *G. lavandula-*

cea, *Muehlenbeckia adpressa*, *Cassytha glabella*, *Acacia armata*, *A. verticillata*, *Dacysia corymbosa*, *D. ulicina*, *Pultenaea* sp., *Platylobium obtusangulum*, *Hardenbergia monophylla*, *Correa rubra*, *Comesperma polygaloides*, *Spyridium coactilifolium*, *Hibbertia* sp., *Melaleuca decussata*, *Eucalyptus angulosa*, *E. calycogona*, *E. cneorifolia*, *E. conglobata*, *E. cosmophylla*, *E. fasciculosa*, *E. leptophylla*, *Halorrhagis leucroides*, *Brachyloma ericoides*, *Styphelia exarrhena* (in flower, May), *Astroloma conostephioides*, *A. humifusum*, *Dichondra repens*, *Prostanthera chlorantha*, *Olearia ramulosa*, *O. pannosa*, *Cassinia aculeata*, *Helichrysum Baxteri*.

As Waitpinga Creek is approached, the rough scrub of this area and the adjacent patches of glacial sands merge into a country of stabilized sand dunes and travertine limestone. In the early days, lime for building at Encounter Bay and its neighborhood was obtained from this locality. Rough hill-slopes are formed by the limestone which also forms a capping to the underlying nearly vertically tilted rocks of Newland's Head itself. The somewhat shifting sand is probably encroaching on the limestone, due to the disturbance caused by sheep and rabbits. As with these changes in the soil, the vegetation alters considerably, it is necessary to refer to the plants found separately. On the rough limestone slopes just east of Waitpinga Creek, such trees occur as *Casuarina stricta*, *Acacia rhetinodes* (abundant here and on the adjacent sand, forming neat little embracing trees quite different in appearance from the shrubs found near creeks and with shorter leaves—the trees are stripped for wattle-bark), *Melaleuca pubescens*, *Eucalyptus diversifolia* (abundant), *E. leucoxydon*, *E. fasciculosa* and one small Native Peach (*Fusanus acuminatus*). Scattered amongst these as shrubs and undershrubs, etc. are the rough sedge, *Gahnia deusta* (in colonies), tufts of *Scirpus nodosus* and *Lepidosperma concavum*, occasional grass-trees (*Xanthorrhoea semiplana-Tateana*), *Muehlenbeckia adpressa* (climbing up shrubs), *Adriana Klotzschii*, *Pimelea serpyllifolia*, *Nicotiana suaveolens* and the thistle *Cirsium lanceolatum*. Just beside Waitpinga Creek, the stabilised sand-dunes are covered with large bushes of *Acacia longifolia* var. *sophorae*, the same form of *A. rhetinodes* already mentioned, but here shrubby, and *Pimelea serpyllifolia*. These shrubs form dense tangles with many prostrate branches with bare sandy ground between the clumps. The hard seeds of *A. longifolia* seem to be abundantly eaten by birds, probably silver-eyes (*Zosterops*), but pass through undigested (except perhaps the funicles). A few Fire-tailed finches (*Zonaeginthus bellus*) seen in these shrubs

can probably deal more efficiently with these seeds, though it is possible that the dropped seeds under bushes near water were passed by them and not by other birds.

On Newland's Head itself, a low scrub, a few inches to a foot or so high, covers the travertine limestone and descends on this to the cliff sides. Here may be found *Poa caespitosa*, clumps and patches of the rough-leaved *Gahnia deusta* contrasting with the smaller, more filiform and smooth-leaved *G. lanigera*, *Lepidosperma concavum*, prostrate *Eucalyptus diversifolia* only one or two feet high and yet having fruited and covering several square yards of ground—these "trees" approach quite close to the cliff edge, sometimes *Melaleuca pubescens* (similarly prostrate), numerous shrubs of rather broad-leaved *Beyeria Leschenaultii* (especially on the lower slopes) and of *Pimelea serpyllifolia* (similarly situated), *Olearia axillaris* (perhaps *O. ramulosa*), and odd plants of *Lomandra effusa* (fairly common), *L. glauca* (?) (occasional), *L. juncea* (uncommon), *Corra rubra*, *C. alba*, *Daviesia* sp. (leafless, rigid, very prickly), *Alyxia buxifolia*, *Galium ciliare* (very small plants), *Lobelia gibbosa* and a *Helichrysum*. *Schoenus Tepperi* forms occasional patches of harsh "sward." The Kangaroo Island *Daviesia pectinata* and some tussocks of Porcupine-grass (*Triodia irritans*) in sand, are also to be found near Newland's Head itself.

XI. Glacial Sands, Varying from Almost Pure White Sand to Sandy Loam.

Glacial sands have been left in several areas behind the Bluff and behind (north) of Victor Harbour, occupying gentle hilly slopes or ridges. The Waitpinga road passes through such a sandy patch just after mounting the high hill from Encounter Bay and crossing the bridge. This area is more than a mile in extent in each direction and passes north-west behind Tugwell's strawberry garden, towards the Bluff. West of this the sand appears stretching towards Waitpinga parallel with and inland to the rough belt of low scrub bordering the sea-cliffs. Sand also appears on the west side of the Inman Valley road before one reaches Back Valley and along the Back Valley track. Sandy areas also occur on the ridge behind Victor Harbour. They correspond with the glacial sands of the Mt. Compass region, but not geologically with the sandy area off the MacLaren Vale Flats or with that east of Happy Valley. Though most of the plants are common to both, the two last-named areas show the presence of *Prostanthera Behrrii*, which is absent from the Encounter Bay district altogether.

The characteristic and abundant plants of the glacial sands are the two species of *Banksia*, *Leptospermum myrsinoides*, *Eucalyptus Baxteri* (in patches, almost confined to the sand), *E. cosmophylla*, *E. diversifolia*, bracken fern (in places), *Hypolaena fastigiata* and *Phyllota pleurandroides*. In the sands towards Waitpinga, *Lhotzkia glaberrima*, a Kangaroo Island species, is abundant but does not occur east of this. Owing to the poor nature of the sandy soil, the individual plants are more or less separated from each other by bare spaces, so that one can walk in and out between the vegetation without treading on it.

The plants found in this area comprise the following:—*Pteridium aquilinum*, *Amphipogon strictus*, *Dichelachne crinita*, *Lepidosperma laterale*, *L. concavum* (*viscidum*), a terete-leaved *Lepidosperma*, *L. carphoides*, *Gahnia deusta*, *Hypolaena fastigiata*, *Lepidobolus drapetocoleus*, *Thysanotus dichotomus*, *Xanthorrhoea semiplana-Tateana*, *Patersonia glauca*, *Casuarina pusilla* (low cushions, rarely a foot high), *Isopogon ceratophyllus*, *Adenanthos terminalis*, *Conospermum patens*, *Haakea rostrata*, *Banksia marginata*, *B. ornata*, *Cassytha glabella*, *Pultenaea trineis*, *Phyllota pleurandroides*, *Correa rubra*, *Comesperma calymega* (not common), *Cryptandra leucophracta*, *Hibbertia sericea* var. *scabrifolia*, *H. virgata*, *Calythrix tetragona*, *Lhotzkyia glaberrima*, *Baeckea crassifolia*, *Leptospermum scoparium*, *L. myrsinoides*, *Melaleuca fasciculiflora* (on edge, near a semi-swamp, Waitpinga sands), *Eucalyptus Baxteri*, *E. cosmophylla*, *E. diversifolia*, *E. fasciculosa* (occasionally), *Halorrhagis tetragyna*, *Trachymene heterophylla*, *Astroloma conostephioides*, *A. humifusum*, *Leucopogon virgatus*, *L. rufus*, *Stylidium graminifolium*, *Olearia ramulosa* (very occasionally), *Ixodia achilleoides*, *Helichrysum Blandowskianum*, *H. Baxteri*, *H. obtusifolium* and *H. apiculatum*.

—X—

The Section congratulates Prof. Harvey Johnston on his appointment as Director of the Adelaide Museum and Mr. H. M. Hale on his appointment as Curator.

Prof. T. G. B. Osborn, now of the Sydney University is still interested in Botanical studies in this State, and is spending his vacation at Koonamore in connection with his researches in the native fodder-plants of Australia.

ADDITIONS TO OUR LIBRARY.

"Dramas of the Wild Folk". By H. Mortimer Batten, F.L.S. Thrilling incidents in the lives of wild animals, graphically and sympathetically set forth and illustrated.

A HOLIDAY ON CORAL ISLANDS.

Part II. (Continued).

Lady Musgrave Island, being quite denuded of plant growth beneath the tall trees, gave us a splendid chance to observe the bird life, of which we availed ourselves. Molluscs are got by much searching, but the birds simply swarmed around us in countless numbers by day and night. We enjoyed watching them, but hearing them was far from enjoyment as sea birds are not good songsters, and one can safely say that during the six days we spent on the Island, there was not one moment when the noise of birds could not be heard! We learnt to love the first bird which welcomed(?) us, the White-capped Noddy (*Megaloptyrus minutus*), which was so tame and loving in its ways. It is about the size of a blackbird, dark slaty color, with a white cap on its head, from which it gets its common name. It was nesting time and every tree on the islands had nests in, some having more than 100. They were very numerous in the trees overspreading our tents, from which we watched the nest building proceeding. The birds were so tame that sometimes we could stroke them while on the nest, and the pairing and love-making were delightful to see. On some branches the nests were so close that the sitting birds could almost touch each other. The nests are made of pisonia leaves, and a sponge-like sea weed, glued in place by the excreta. In a very shallow hollow without feathers or other lining material, one egg was laid, a very large one for such a small bird. The birds seem to watch till the wind caused a yellowing leaf to fall, and frequently we saw birds catch them before they reached the ground. If the leaf reached the ground there was a screeching competition among the crowd of birds also wanting material. There was much chattering as the successful bird told his wife how he got it, and in watching the care with which it was stuck in the nest we were much interested. The noddies had a difficulty in rescuing a falling leaf if a goat happened to be near as leaves must be a goat's principal food, and drink, also. Father noddy assisted dutifully in the incubation of the eggs and it was a pleasing sight to see him fondling his wife, who gently raised herself and on leaving the nest the male quickly occupied it. Each feeds the other at times, and when not on the wing is sitting close to the nest and chattering love noises! Silver gulls are robbers of eggs and are ever on the look out. They take many noddy eggs, unless carefully guarded. There is no doubt that the noddy has been the principal agent in the dispersal of the seeds from which the great Pisonia trees have sprung, which now add so greatly to the beauty of these coral islands. The seeds are hooked and very

sticky, and birds are sometimes found which are quite unable to fly owing to the feathers being stuck together. The noddies shared the Island with the Wedge-tailed Shearwater (*Thyellodroma pacifica*) or Mutton bird, as it is commonly called, which is no doubt the most common bird on the islands of the two Groups. It is estimated that quite three millions of these birds live hereabout, the largest number being found on North West Islet. They live in wonderful harmony [this does not apply to their singing(?)] with the noddies, as they burrow in the soft coral sand for nesting purposes, leaving the trees for the noddies. Most of them leave the island to go fishing some time before the noddies start work, and they return to their burrows some time after noddies have gone to roost; truly a very convenient arrangement! The mutton bird is also dark slatey colored, without any markings, about the size of a pigeon. The island was absolutely undermined with their burrows and our camp was evidently the "Rundle street" of the birds as we had many reminders that we were interlopers occupying their streets. Walking about at anytime was not pleasant, but at night was dangerous even by torchlight. We were amused watching the capers of the males at night time when they were wooing. He placed his head, with lowly movement, near his lady love, making a low wailing sound, following with cat-like purrs, calls like that of a child, and then there would be a burst, with distended throat, like that of a loud-speaking Thomas cat! Truly as a songster a wooing love lorn mutton bird is unbeatable! This kind of music goes on unceasingly, the noddies, in the trees, also helping. If the female accepts the advances so sweetly made, home making starts at once, and soon the two are busy resting on their breasts, and with both feet the coarse coral sand is sent flying out in clouds. They are very tame, easily picked up and in the light of lanterns their bewilderment was funny, but at times a real nuisance as they dashed among the tea things and many lanterns were knocked over by them. There was a lessening of the noise about 4 o'clock, and we knew they would soon be leaving for the sea, and the way in which they did this was a truly wonderful sight when seen at North West Islet, where the vegetation was dense. In this thick scrub well defined paths have been made by the constant use, by immense numbers of birds, of these tracks as they run towards the sea. These paths are like the tributaries of a great river, and as each contributes its share to the stream of birds on the main track the sight is unforgettable, especially when the stream of birds arrives at the coral at high water mark when with a run they mount like an aeroplane into the air and they are off fishing!

The home coming, just as darkness sets in, is most wonderful and the way the birds found their own nests amid the tangled vegetation showed a miraculous homing instinct. They fly low over the waves and nearing the tall trees they rise and circle round, so closely packed as sometimes to touch each other. Suddenly as they locate their home surroundings, with wings rigidly elevated, they drop with a thud on soft sand near their burrows. As we sailed from island to island we frequently saw flocks of noddies and mutton birds busy catching fish as they dashed out of the sea when pursued by larger fish, and then we realised how utterly impossible it is for us to conceive the vast number of fish required to supply the wants of the two kinds of birds we have been thinking of. It is reported that one investigator took 400 tiny anchovy-like fish from the stomach of one noddy!

W. J. KIMBER.

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SOUTH AUSTRALIAN AQUARIUM SOCIETY.

Interest in the objects of the Society is being well maintained. At a meeting held on Tuesday, May 8th, at Mr. Hosking's rooms, Norwood, 22 members were present to view fancy goldfish exhibited by members. Mr. T. Nettlebeck, who has specialized in the breeding of "scaleless" goldfish, showed a number of fine examples of Shubunkin or Harlequin goldfish, and also fantail or Calico scaleless fish produced by crossing the Shubunkin with "scaled" goldfish and so producing the "scaleless" fantail. The term "scaleless" is a misnomer in the case of these fishes—"transparently scaled" would be a better term; in varieties of this type the thin skin covering the scales is absolutely devoid of colour cells, and the scales themselves are glass-like, so that the colours underlying the scales are apparent in all their beauty. The result is a wonderfully soft, variegated colouration not found in other varieties of goldfish; the specimens exhibited showed non-metallic blue, red, black and white. Mr. J. W. Hosking also showed Shubunkins, as well as many fine fan-tail goldfish of large size, while Mr. A. E. Wadey exhibited a large Comet-tail with particularly long and flowing fins.

Mr. Reg. T. Foster was congratulated on his promotion to the important position of editor of the "Register". Mr. Royce Carpenter was congratulated on his recent marriage and the best wishes of members were extended to him and Mrs. Carpenter for future happiness and prosperity.

At the close of the formal meeting a musical evening was arranged by Mr. and Mrs. Hosking, at which Mr. H. M. Hale was congratulated upon his appointment to the Curatorship of the South Australian Museum.

SOUTH AUSTRALIAN SHELL COLLECTORS' CLUB.

Since the issue of the February "Naturalist" this Club has been engaged in further study of South Australian Bivalves.

Of the two main divisions of Mollusca—Gasteropoda (uni-valve), and Pelecypoda (bivalve)—the latter, though comprised of fewer families, far exceed the Gasteropoda in numerical strength.

Confirmation of this fact may be had on an examination of almost any shelly beach. In favored localities immense numbers of bivalves live in shallow water, under the sand, such as *Donax*, *Macra*, *Amphidesma*, *Pinna*, and on the rocks *Mytilidae* cling in countless thousands. The Bivalves (two-piece shells) present an interesting field for study. Their varied hinge systems. Some exceedingly complicated, as exist in *Trigonia* and *Glycimeris*, down to simple forms as in *Ostrea*; the method of valve closing by contraction of attached muscles, and automatic opening by means of an elastic ligament; their varied shapes, some slender, others massive, suited to their particular habitat, the texture of the shell, transparent, opalescent, porcellaneous, nacreous, all tend to excite interest.

Following the lines of scientific classification as far as applies to South Australian Bivalves, the Club has taken the following families:—

Solemyidae, *Nuculidae*, *Arcidae*, *Pinnidae*.

Well known representatives of these families are as follows:—

FAMILY SOLEMYIDAE.

Solemya australis, Lamarck, is a common form on our beaches, where it buries in soft mud. The light and fragile horn-colored valves contain only a small percentage of the common shell-forming material, carbonate of lime. A remarkable fringed periostracum extends over the ventral edge.

FAMILY NUCULIDAE.

Nuculana crassa, Hinds. Many single valves are found on Middleton Beach, and we have specimens dredged from the waters of Aldinga Bay and Beachport. The hinge is comprised of a row of about forty fine comb-like teeth, in the centre of which is the ligamental pit. The shell is rounded anteriorly and pointed at posterior end. The concentrically grooved valves are covered with an olive-green periostracum.

FAMILY ARCIDAE.

Arca fasciata, Reeve, are often picked up under stones in low water, and sometimes a seaweed root firmly attaches itself to one of the valves. The straight hinge line is made up of many small fine teeth. This shell has a thick and shaggy periostracum.

Arca trapezium, Deshayes. Sub-fossil valves are found in South Australia, and have been obtained from bores at great depth. Geologists state that thousands of years ago *Arca* was common in our waters, but with the advent of a cold phase, this shell migrated northwards to warmer climates, no living specimens remaining in South Australia. The writer noticed recently numbers living in the mud banks of the Hawkesbury River, N.S.W.

Glycimeris radians, Lamarck, also has a complicated hinge system, and, once opened, it is difficult to again lock the valves. This shell is covered by a dark reddish-brown periostracum.

The valves are solidly constructed, with the ventral edge finely crenated.

FAMILY PINNIDAE.

Two members of this family live in South Australian waters. The late Mr. Chas. Hedley, in a paper issued by the Australian Museum, Sydney, divided *Pinnidae* into two sections, *Pinna* and *Atrina*. Hedley pointed out that a true *Pinna* had angled shoulders with a sinus dividing the interior nacreous tract; while the shorter, rounded specimen, without any such interior divisional groove was an *Atrina*.

Pinna inermis, Tate, our common type, therefore comes under the first division. Large beds of these shells live in many parts of our shallow coastal waters. At low tide the valves project from the sand, in which they live in an upright position, firmly attached by a strong byssus.

Mr. Hedley also pointed out, in the same paper, that according to the rules of priority, the specific name "*inermis*," Tate, should now give place to "*dolabrata*," Lamarck. The second shell, "*tasmanica*," should be called an *Atrina*. This bivalve is rarely found, but has been taken off Largs Bay and at Port Willunga. The valves are surmounted by numerous raised scales.

Considerable controversy has taken place between local collectors as to the exact position of an intermediate variety, frequently found among other *Pinnas*. This shell has about 16 rows of closely packed elevated scales, appearing as vertical ribs on the valves—a distinct contrast to the smooth form.

F. TRIGG,

Hon. Sec. S.A. Shell Collectors' Club.

May, 1928.

EXCURSIONS.

EXCURSION TO BLACKWOOD EXPERIMENTAL
ORCHARD, MARCH 3rd, 1928.

A large party visited the Orchard and were shown round by the manager, Mr. Fowler, who gave members a great deal of interesting information on the work of the orchard.

EXCURSION TO MOUNT LOFTY AND LONG GULLY,
MARCH 10th, 1928.

Mr. Hogan led a number of members on a walking expedition from Mt. Lofty to Long Gully Station. The weather was pleasant and the party enjoyed the walk through the scrub, noting the various species of gum and wattle.

EXCURSION TO HALLETT'S COVE, MARCH 24th, 1928.

A large party visited the Cove under the guidance of Dr. C. Fenner and Mr. W. Ham. Tate's Rock and other ice-marked rocks were seen and the leaders spoke on the interesting geological changes which were revealed by the rock formations in the Cove.

EXCURSION TO Mr. J. A. HARPER'S AT DASHWOOD'S
GULLY, APRIL 25, 1928.

Mr. Botting's charabanc conveyed members to Dashwood's Gully where they were met by Mr. Harper, who placed his house at their disposal and showed the party over the estate, across the paddocks and through the scrub. Mr. Harper's conversation proved most instructive. The Section should avail themselves of our host's kind invitation to visit the virgin scrub (about 900 acres in extent) in late spring.

EXCURSION TO THE OUTER HARBOUR, MAY 5th, 1928.

The Shell Club led a party to the Outer Harbor. Many interesting shells were secured, and these were described by Mr. W. J. Kimber and other members.

EXCURSION TO WATERFALL GULLY, MAY 19th, 1928.

A large number of members walked to the Falls, where the physiographical features of the valley were described by Mr. W. Ham and Mr. J. A. Hogan, who led the party.

LECTURES.

TASMANIAN EVENING, MARCH 20th, 1928.

Dr. C. Fenner dealt with the Geology of Tasmania. Sir Wm. Sowden spoke on Penology and made special reference to the early days of Tasmania. Prof. J. B. Cleland and Mr. E. H. Ising dealt interestingly with the Botany, and Mr. W. Ham spoke on the geographical and economic aspects of the island.

"A TRIP TO CORAL ISLANDS." Mr. W. J. KIMBER. APRIL 17, 1928.

Before a very fine attendance of members Mr. Kimber gave an illustrated lecture dealing with his recent trip to Coral islands in the Great Barrier Reef.

MIGRATING WATER-BEETLES.

In 1925 Mr. Fred W. Shepherd noted a migration of water-beetles at Broken Hill, New South Wales, and a record of the occurrence was published in the Naturalist (vol. VI, p. 43). Mr. Shepherd now sends a further note regarding migrations of the same species (*Eretes australis*). "Some years ago I wrote to you about water-beetles migrating and covering a new iron roof in the moonlight. Since then until a few days ago there has been no movement of these beetles *en masse* on account of the several years drought. Since the March rains nearly all the dams and water-holes have filled, and on April 1st and 2nd these beetles passed over this city (Broken Hill) in countless thousands. Many attracted by reflected moonlight, alighted on the shining black roads, and hundreds of thousands, attracted by the city lights, swarmed on windows and footpaths."

HERBERT M. HALE.

EXCURSIONS.

The special attention of members is drawn to the fact that the charabanc excursions are entailing losses to the Society. Unless members book up, in sufficient numbers, at least two weeks beforehand, it is probable that all charabanc trips will be abandoned.

THE MICROSCOPE CLUB.

The Microscope Club of the F.N.S. have held three meetings since its inception on December 1st, 1927. The club was formed with a view to helping members of the F.N.S. in their nature studies by the aid of that handmaid of all sciences—the microscope, revealing as it does a world of wonder otherwise unknown. At each meeting it is hoped to take up some special branch of study and have helpful talks, beside the general study, also helping each other by exchange of material, hints, and ideas.

As the membership increases specialists will be invited to demonstrate before the Club and this will prove, doubtless, a very valuable feature.

Dr. Fenner has very kindly promised to give an evening on "Rocks", the date to be given later.

A cordial invitation to come to the meetings is extended to all the members of the F.N.S. The possession of a microscope is not an essential to anyone joining the Club. Mr. F. B. Collins, Hon. Sec., will be glad to take the names of intending members.



OUR EXCHANGES.

SMITHSONIAN PUBLICATIONS:

The New Outlook for Cosmogony; Influence of Sun Rays on Plants and Animals; On the Evolution of the Stars; Excursions on the Planets; High Frequency Rays of Cosmic Origin; Radio Atmospheric Disturbances; Cold Light; The "Maud" Expedition, 1922-1925; The Romance of Carbon; The Loess of China; The Gem Districts of Ceylon and Burma; The History of Organic Evolution; Barro Colorado Island Biological Station; The Pocket Gophers of California; How Beavers Build; The Effect of Aluminium Sulphate on Rhododendrons, etc.; The Earth quakes of Eastern U.S.; Eastern Brazil through an Agrostologist's Spectacles; Our Heritage from the American Indians; The Parasite Element of Natural Control of Injurious Insects and its Control by Man; Fragrant Butterflies; The Ritual Bullfight; The Bronzes of Hsin-Cheng Hsien; The Katcina Altars in Hopi Worship; Omaha Bow and Arrow Makers; The National Park of Switzerland; Samuel Slater and the Oldest Cotton Machinery in America; Preventive Medicine; William Bateson; H. Kamerlingh Onnes.

Journal of the Arnold Arboretum, Vol. VIII, Numbers 3 and 4;

Year Book of the Academy of Natural Sciences, Philadelphia, U.S.A.;

The South Australian Ornithologist, Vol. IX. Parts 5 and 6.

The Victorian Naturalist, December, January, February, March and April numbers. The Victorian Naturalist Club has discarded its sea shell and adopted the Red Correa as a badge.

The Australian Museum Magazine for April and June.

The Tasmanian Naturalist. Numbers to November, 1927.

Papers and Proceedings of the Royal Society of Tasmania for 1927.



The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide



Aug., 1928

VOL. IX.,

No. 4

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The authors of papers are responsible for the facts recorded and opinions expressed.

Address of the Section: C/o Royal Society's Rooms, Institute Building, North Terrace, Adelaide.

Published Quarterly

Single Copy NINEPENCE

Obtainable from Cole's Book Arcade, No. 14 Rundle Street,
Adelaide.

Felstead & Ormsby, Print, Gilbert Place, Adelaide. Phone C. 1531

The South Australian Naturalist.

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Vol. IX.

AUGUST, 1928.

No. 4.

THE PLANTS OF THE ENCOUNTER BAY DISTRICT NOTES ON THE ECOLOGY (Continued*)

By J. B. Cleland, M.D.

Continued from Vol. IX., No. 3, May, 1928, p.p. 45-48,
where see previous references to this series.

IX. Gravelly Hills with Undershrubs, Especially low Casuarinas.

A good example of this type of country may be seen in places on the dividing range between the Waitpinga Road and Back Valley. Ascending the slopes from one direction (the Waitpinga Road near the bend) one passes gradually from sandy soil, which is being cleared and cultivated, into a stiffer sandy soil, which gradually passes into sandy clay in which appear ironstone pebbles and quartz fragments, with occasional small rocky outcrops as the top is approached. Ascending from Hall's Creek the slopes are at first more clayey and intersected with small valleys with larger trees and shrubs. The flora therefore of these hills grades imperceptibly into that of the adjacent areas. One may say that the predominant feature of the area in question is the abundance in many parts of low Casuarinas, reaching from one to two feet high in the poorer upper parts to breast high lower down. The upright branches of *C. striata*, laden with their cones, at times, makes walking difficult, though a way can be picked between the shrubs. The other two species (*C. pusilla* and *C. Muelleriana*) are usually lower and are more rounded in shape. Between the Casuarinas are many other shrubs and under-shrubs forming in aggregate more individuals than the Casuarinas but with no species as dominant. Thus *Xanthorrhoea semiplana*, *Banksia marginata*, *Hakea rostrata*, *H. ulicina*, *Isopogon ceratophyllus*, *Lepidosperma* especially *L. car-*

phoides and *Phyllota pleurandroides* are present as many scattered individuals, and in places *Schoenus Tepperi* forms a close-set sward. Near the top, *Epacris impressa* is abundant, a plant not common in the district except in the Upper Hindmarsh Valley. *Spyridium thymifolium* also is common near the summit. Little groups of mallee-like eucalypts appear from time to time, *E. Baxteri* occurring low down in the sandier part, the others comprising *E. leptophylla*, *E. angulosa*, *E. cosmophylla* and *E. fasciculosa* (where the soil is stiffer). Near the summit in rather rocky ground are some clumps of *E. odorata* var. *cajuputea* which seems in the field distinct from the type. Of much interest is the occurrence, also near the top, of several groups of the Kangaroo Island oil mallee, *E. cneorifolia*. Grasses are very infrequent.

The following list comprises some of the commoner species met with in the more sandy lower part first met with on commencing the ascent. (Those species with an asterisk* were found also higher up). **Schoenus Tepperi*, *Lepidosperma concavum*, **L. carphoides*, *Xanthorrhoea semiplana*, *Hypolaena fastigiata*, leaves of an orchid, **Casuarina striata*, **C. pusilla*, **C. Muelleriana*, **Isopogon ceratophyllus*, *Adenanthos terminalis*, **Persoonia juniperina* (rare), **Hakea rostrata*, **H. ulicina*, **Bankia marginata*, *B. ornata*, **Cassytha glabella*, *Drosera Whittakeri*, **Daviesia brevifolia*, *Pultenaea*, **Platylobium obtusangulum*, *Correa rubra*, *Boronia filifolia*, *Tetratheca pilosa*, *Micranthemum Tatei*, **Spyridium thymifolium*, **Hibbertia*, *Leptospermum myrsinoides*, *Melaleuca decussata*, *Eucalyptus Baxteri*, *E. leptophylla*, **E. cosmophylla*, *E. angulosa*, *E. fasciculosa*, *Styphelia exarrhena*, **Astroloma conostephioides* and *Brachyloma ericoides*. At a higher level, in poorer soil, in addition to those mentioned above and indicated with an asterisk*, the following were noted:—*Lepidosperma semiteres*, *Phyllota pleurandroides*, *Phyllanthus australis*, *Baeckea ramosissima*, *Eucalyptus odorata*, var. *cajuputea*, *E. cneorifolia*, *Acrotriche serrulata*, *Epacris impressa* and *Goodenia primulacea* (*geniculata*, sensu lat.)

X. Hills, Usually High, and Sheltered Valleys of Better and Deeper Soil, Supporting Forests of Merchantable *Eucalyptus obliqua*.

Forests of *Eucalyptus obliqua* of merchantable size are met with on the plateaux of the Hindmarsh Tiers at a height approaching 1000 feet. There is a certain amount of *E. obliqua* forest also in the rough country lying towards the dividing range behind the coastine between Tunkallila and Waitpinga. The

Hindmarsh Tiers on their southern aspect in the distance overlook the Inman Valley and send an outlier, in the shape of Strangways Hill—Inman Hill—Tower of Babel, south-eastwards towards the Inman River. A rough road leads off northwards near the eighth milestone on the Yankalilla Road, passing between the residences lately occupied by Mr. Moulden and the Crossmans, and ascends along the shoulders of hills to the Hindmarsh Tiers, connecting up eventually with the road from Myponga to Hindmarsh Valley, near the pine plantations of the Zinc Corporation Limited. As this road reaches the Tiers, the country rapidly changes from grass or bracken-covered hills with a few *E. viminalis* and Blackwoods (*Acacia melanoxylon*) scattered about to a forest reserve of an almost pure stretch of *Eucalyptus obliqua* with some *E. Baxteri*. Geologically, this forest area belongs to the Adelaide series and the country reminds one much of the neighbourhood of Mt. Lofty. Rough stony hills of loose quartzite appear in places. Our description is taken from this portion of the area in question.

The forest has evidently undergone considerable alteration as a result of many destructive bush fires. The stringy-barks now are separated from each other in many places by a distance of 20 to 40 feet, but from decayed stumps were formerly evidently much closer. The stand is almost a pure one of *E. obliqua*, the only other species with it being *E. Baxteri*, also a forest tree, in small numbers. It seems worth investigation to see whether this forest form of *E. Baxteri* is specifically identical with the low diffuse mallee-like form met with on the glacial sands at much lower elevations—the juvenile leaves may possibly show a difference. The trunks of the older trees are often of considerable diameter, but the boles are often far from straight, indicating that in such places the stand had never been very close. The "punk fungus", *Polyporus eucalyptorum*, was noted high up on one stringybark. In the forest proper no other trees were seen, as is the case in the Mt. Lofty Range itself. Underneath the trees, grass-trees (*Xanthorrhoea semiplana*) are usually dominant, leaving little more between their long spreading leaves gracefully bending towards the ground, than room to pass with comfort. The grass-trees consequently far outnumber the Eucalypts, and may compose the only other plants under the canopy over considerable stretches of ground. Bracken (*Pteridium aquilinum*) however is often associated and sometimes may be alone present. In moister parts, *Acacia myrtifolia* may appear in relative abundance with *Pultenaea daphnoides*. An interesting find in a slight depression was *Pultenaea graveolens*, occurring as several neat shrubs about 4 feet high, whose leaves smell of curry-

powder. From a superficial comparison it seems doubtful whether the plants from the Brisbane Range, Victoria, referred to this species are the same as the South Australian plants. Grasses are almost non-existent. The other species met with and given in the following list occur only as widely separated plants, playing no part in the general facies.

The list of plants noted in a short survey is as follows:—*Lindsaya linearis*, *Pteridium aquilinum*, *Danthonia*, sp., a grass (not in flower), *Lepidosperma semiteres*, the orchid *Dipodium punctatum* (in flower January), *Isopogon ceratophyllus*, *Persoonia juniperina*, *Hakea rostrata*, *Drosera Whittakeri*, *Acaena sanguisorbae*, *Acacia myrtifolia*, *Ac.* sp. (uninerves), *Daviesia corymbosa*, *D. ulicina*, *Pultenaea daphnoides*, *P. graveolens*, *Platylobium obtusangulum*, *Correa aemula*, *Poranthera microphylla*, *Hibbertia stricta*, *Viola betonicifolia*, *Eucalyptus obliqua*, *E. Baxteri*, *Astroloma humifusum*, *Acrotriche serrulata*, *Epacris impressa*, *Opercularia varia*, *Goodenia* (*G. geniculata* group), *Olearia grandiflora* and *O. ramulosa*.

Along the side of a commencing creek were noted:—*Adiantum aethiopicum* (Maiden Hair Fern), *Juncus pallidus*, *J. pauciflorus*, *Dianella revoluta*, *Pimelea spathulata*, *Leptospermum scoparium* (abundant), *Halorrhagis teucrioides*, *Hydrocotyle hirta*, *Gratiola peruviana* (common), *Goodenia ovata* (abundant), *Gnaphalium* sp. and a daisy-like composite.

On a rough hill covered with loose quartzite, it was interesting to see the stringybarks replaced by *Eucalyptus fasciculosa*. Other plants on this area comprised *Cheilanthes tenuifolia*, *Dianella revoluta*, *Thysanotus Patersonii*, *Persoonia juniperina*, *Hakea rostrata*, *Drosera* (leaves along the stem), *Oxalis corniculata*, *Hibbertia stricta* and *Astroloma conostephioides*.

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NOTES ON THE GERMINATION OF THE SEEDS OF AUSTRALIAN NATIVE FLORA

By Edwin Ashby, F.L.S., Etc.

Table I.

In my garden "Wittunga", Blackwood, an attempt is being made to bring together within reasonable compass, a collection of growing Australian Natives, mostly bushes, shrubs and ornamental plants, representing as many of the Australian genera as possible, these being labelled with family as well as generic and specific names. It is desired that this collection may be available to all students of Botany and also that thereby the feasibility of growing our beautiful native flora in our gardens, may be demonstrated and encouraged.

There are now growing at "Wittunga" some 250 named species of Australian Natives and at least a third as many more unidentified, very many of these have been raised from seed and an attempt was made to keep records of dates of germination during the Summer of 1926-27, giving the length of time from sowing, the conditions that induce germination such as temperature, moisture and the age of the seed where this was known.

In presenting the data supplied by these notes the writer is conscious of their fragmentary nature, compared with the large amount of material that has been handled by him; the notes deal with representatives of the following families and sub-families:—*Caesalpinoideae*, *Mimosoideae*, *Papilionatae*, *Myrtaceae*, *Proteaceae*, *Pittosporaceae*, *Campanulaceae*, *Rutaceae*, *Sapindaceae*.

Temperature.—It is well known that temperature is a most important factor in stimulating or retarding germination. Almost all the Legumes were before sowing placed in eggcups and hot or boiling water poured on, the amount of water being limited, the heat was not maintained long enough to damage the seed but was sufficient to expand or fracture the tough outer coat. To produce actual germination a few days of continued high temperature seems to be desirable for most, if not all, Australian Natives, I have noticed that the scale of germination is in excess during "hot spells"; I am indebted to Mr. E. Bromley, the Divisional Meteorologist, for the record of the shade temperatures during the summer of 1926-7 and note that 50 per cent. of the germination was induced during the hot weather, although the date noted may be beyond the conclusion of such hot spell.

My practice is to sow in 3 in. pots about once every two months, during the sowing season; seeds sown during June and July rarely germinate, the average temperature, even under glass, is sufficiently low to cause the seeds to rot.

In Western Australia, during the Winter, the sunheat is higher and a warm steamy atmosphere prevails between the spells of wet weather, and I believe a good deal of germination of native seeds takes place naturally, during that season, but in this state conditions are dissimilar. Seeds of many Myrtaceous shrubs such as the genera *Melaleuca*, *Callistemon*, *Calothamnus*, *Leptospermum*, *Beaufortia* &c., germinate very easily when sown on the surface, uncovered by any soil, the pots kept damp, I have them on a shelf suspended by g.i. wire (for protection from slugs), and placed within two feet of the glass, which is shaded in Spring and Summer. The temperature on this shelf during the hot spells runs up in the day to 100 degrees and sometimes 114 degrees. It is no uncommon thing for from 100 to 300 seedlings to come up when such minute seeds as those

of *Melaleuca* or *Callistemon* have been sprinkled over the surface, it is obvious that to induce such germination the surface must be kept continuously moist and therefore it has been my custom to spray the pots at midday as well as morning and evening, on hot days. I was led to adopt this method from having observed in the "Bush," that now and again when these hot, moist conditions had been somewhat prolonged, the germination under the partial shade of some bush, was sufficient for the numberless seedlings to actually lift the surface of the soil. One realizes how rare it is under natural conditions, for these conditions to be sufficiently prolonged to allow the seedlings to get beyond the initial stage. There must be countless millions of fertile seeds produced by these Myrtaceous shrubs and trees, and yet how rarely are seedling plants to be found except in swampy ground. In the "Sand-plains" of the western state the sunheat on the surface of the soil is very high and therefore to obtain good germination we need to imitate these conditions.

Peculiarities of Germination.—Some unexpected and I believe previously unrecorded methods of germination were noticed. The very attractive genus, *Verticordia*, were in my earlier attempts quite disappointing, but as the seed I was experimenting with was at least three years old, having been collected by the Late Mr. Max Koch, who had died three years before, that may have partly accounted for the lack of germination, but not altogether so, because in the later sowings I simply scattered the dried flowers on the surface, making no attempt to cover with earth, when several of the following species germinated, *V. picta*, *V. chrysantha* and *V. Brownii*, later on I had another *Verticordia* sent me under the name *V. densiflora*, of these quite a number germinated, due probably to the younger age of the seed. When the term seed is used, it means faded flowers, the cotyledons push through the centre or near the centre of the flower and the radicle breaks through the receptacle, sometimes in one position, at others in another, these were removed with a penknife into a separate pot.

It appears that the seed is never discharged from the carpel but the whole flower, whose petals are persistent, breaks off just below the receptacle. It will be noted that for successful germination the shed flowers will need to lie receptacle side downwards, and if, as is usual, are quite uncovered, will require sufficient prolonged moisture to allow of the radicle to penetrate the soil.

The mode of germination of the Geraldton Wax Flower *Chamaelaucium uncinatum*, is very similar to that of the genus *Verticordia* with the difference that they need deeply covering with soil.

Along the banks of the River Chapman, near Geraldton, I found seedlings of this bush germinating in large numbers where the flood waters had covered the shed flowers with an inch or more of sandy wash. Seedling plants showing perhaps only half an inch or a little more, out of the ground; these when dug up possessed a thickish, brittle radicle going straight down for three or four inches into the soil, the radicle had broken through the receptacle in the same manner as do the *Verticordias* and the cotyledons had pushed their way through the upper portion of the flower to the ground surface, so that the seedling plants thus dug up had the old flower adhering to the stalk or stem of the seedling plant, about one and half inches from the top. It is generally understood that this shrub is difficult to grow from seed but it is not improbable that if the natural method is imitated, success may be achieved. *Leschenaultia linarioides* has peculiar seeds shaped like an ornamental tile, bilaterally symmetrical, with a central raised fluted rib, the cotyledons grow from one end of this central rib and the radicle from the other.

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NOTES ON THE BREEDING OF THE MEXICAN AXOLOTL.

By C. E. Cole.

Although the Axolotl has been bred many times in captivity, and by members of the South Australian Aquarium Society a number of years ago, of late those that have spawned have done so in the winter time or very early in the spring, but have not been reared owing to the low temperature or other causes, and it is with regret that only two pairs of adults are to be found among the members of the Society at the present time; it is, therefore, to be hoped these notes will be of help to those who may be fortunate enough to possess spawn, even though the weather may not be very favourable for the rearing of the young ones.

The name "Axolotl," which is a Mexican native word signifying "play in the water", is given to the larva of a Salamander (*Amblystoma tigrinum*), which is one of the scientific wonders of the world in that it breeds in the branchiate condition and was thought for a long time to be a perfect aquatic animal, but in the year 1865 a number of the larva bred in captivity in the Jardin des Plantes, Paris, lost their gills and fins on the back and tail, developed eyelids, and, taking to land, proved beyond doubt that it was only an imperfect land Salamander: it has now been found that it is possible to force the metamorphosis by feeding the Axolotl on the thyroid gland.

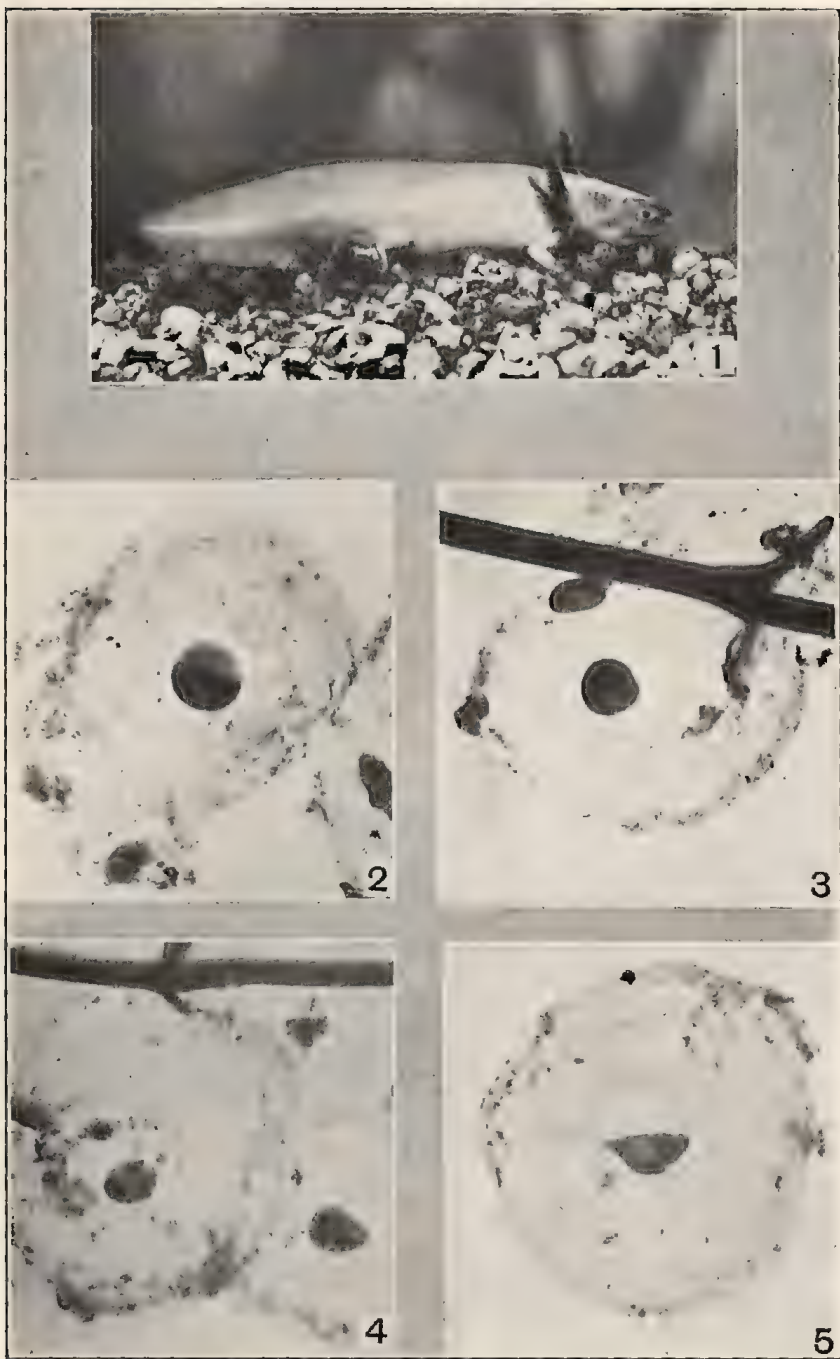
On Monday, June 18th of this year, a pair of these creatures, the male of mottled olive and the female an albino, spawned in cold water, the number of eggs running well over the hundred, the pair were at once removed to another tank and on the following day were found to have covered the plants of that aquarium with spawn. The eggs were spherical and about the size of a green pea and contained, at first, a dark globular mass within the centre envelope, this, within the first two or three days developed, elongated, and within a week assumed the form of the future tadpole. Portion of the spawn from the first batch was placed in an all glass aquarium, in about four inches of water, and the temperature raised to between 78° and 80° Far. On Sunday, 24th, the first development was noted and one of the larva was observed to be rotating, within the gelatinous casing. From then on, further development was noticed for a number of days, until the majority appeared to be on the point of emerging, but it was not until Saturday, 30th, on a bright and rather warm day, during which the temperature of the water went up to nearly 90° Far., that the first youngsters emerged, and within two or three days all had sought more open fields than the restricted space of the egg.

A second batch of spawn, from that deposited on the 19th, was left in cold water until Sunday, 24th, and was then placed with the first batch, of this the majority of eggs did not develop, and what youngsters there were did not hatch until three or four days after those of the first batch, of these very few were of the normal size and by far the greater number did not remain alive more than two days.

I now had thirty larva all told, and after feeding on Infusoria for a week, the majority were able to consume very small *Daphnia*; at this time the weakest, and I am sorry to say almost all the albinos, began to die off and within a few days the number was reduced to about twenty.

From this time on, the temperature of the water was lowered to about 70° Far. and was often down to 60° Far. during the cold nights and frosty mornings. This reduction in temperature was made to give the *Daphnia* a better chance, owing to the change between the cold water in which they were kept and the water of the aquarium.

The little chaps continued to grow, especially two individuals, which soon became twice the size of the smaller ones, and on July 30th one of these was noticed to be endeavouring to swallow one of the its lesser brothers, so these two were promptly removed to a separate receptacle and given larger *Daphnia*.



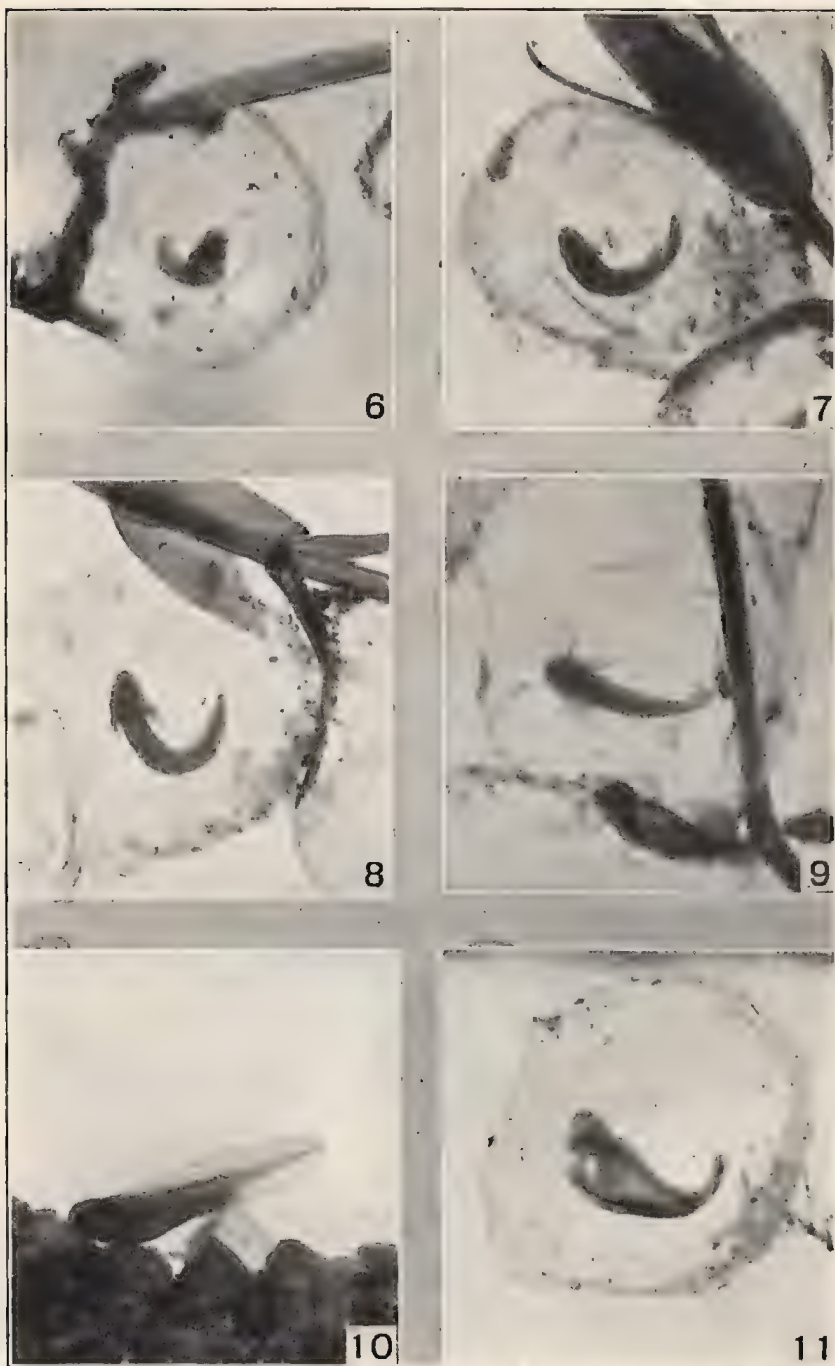
Photos, H. M. Hale

THE MEXICAN AXOLOTL.

GERMINATION OF AUSTRALIAN NATIVE PLANTS.

Date Sown.	Species.	Date of Germination.	No of Examples.	Days Period.	Comments.
CAESALPINOIDAE—					
25/11/26	<i>Cassia pleurocarpa</i>	28/11/26	8	3 days.	Hot spell.
July and Aug.	<i>Cassia pleurocarpa</i>	30/11/26	14	5 days.	Hot spell.
		Two sowings.	Only one	Seed germinated.	
MIMOSOIDAE—					
25/11/26	<i>Acacia acuminata</i>	3/12/26	4	8 days.	Hot spell.
25/11/26	<i>Acacia nr. calamifolia</i>	3/12/26	2	8 days.	Hot spell.
25/11/26	<i>Acacia podalyrifolia</i>	3/12/26	Several.	8 days.	Hot spell.
2/3/27	<i>Acacia saligna</i>	10/5/27	1	69 days.	
PAPILIONATAE—					
9/3/27	<i>Chorizema cordata</i>	8/5/27	14	60 days.	
25/11/26	<i>Erythrina vespertilio</i>	28/11/26	1	3 days.	Hot spell. (seed 3 years old).
25/11/26	<i>Sphaerolobium medium</i>	8/12/26	1	13 days.	
25/11/26	<i>Sphaerolobium medium</i>	22/12/26	9	27 days.	
25/11/26	<i>Sphaerolobium medium</i>	31/12/26	Number.	35 days	
25/11/26	<i>Daviesia quadrilatera</i>	12/12/26	2	17 days.	
25/11/26	<i>Daviesia quadrilatera</i>	22/12/25	1	27 days.	
MYRTACEAE—					
25/11/26	<i>Eucalyptus erythrocorys</i>	28/11/26	1	3 days.	
25/11/26	<i>Eucalyptus erythrocorys</i>	30/11/26	3	5 days.	
25/11/26	<i>Eucalyptus erythrocorys</i>	3/12/26	Number.	17 days.	
25/11/26	<i>Eucalyptus miniata</i>	8/12/26	1	17 days.	
7/12/26	<i>Eucalyptus caesia</i>	12/12/26	5	5 days.	
25/11/26	<i>Alcaluca fulgens</i>	3/12/26	Large numbers.	8 days.	Seed 3 years old.
25/11/26	<i>Alcaluca fulgens</i>	3/12/26	Large numbers.	8 days.	Seed 3 years old.
25/11/26	<i>Leptospermum pubescens</i> var. <i>grandifolium</i>	6/12/26	Several	11 days.	

25/11/26	<i>Leptospermum grandifolium</i>	12/12/26	50	17 days.	
25/11/26	<i>Beaufortia purpurea</i>	8/12/26	2	13 days.	
25/11/26	<i>Beaufortia purpurea</i>	12/12/26	10	17 days.	
25/11/26	<i>Beaufortia purpurea</i>	22/12/26	75	27 days.	
3/3/27	<i>Verticordia chrysantha</i>	29/3/27	1	26 days.	Seed 3 years old.
	PROTEACEAE—				
25/11/26	<i>Telopea truncata</i>	3/12/26	Several.	8 days	
4/3/27	<i>Grevillea paniculata</i>	12/4/27	1	39 days.	Seed 3 years old.
4/3/27	<i>Grevillea excelsior</i>	30/4/27	1	57 days.	Sown outside.
4/3/27	<i>Grevillea excelsior</i>	7/5/27	1	64 days.	Sown outside.
23/4/27	<i>Banksia coccinea</i>	5/6/27	3	43 days.	
3/3/27	<i>Hakea Meissneriana</i>	29/3/27	1	26 days.	3 years old.
	PITTOSPORACEAE—				
17/8/26	<i>Marianthus floribundus</i>	22/12/26	2	127 days.	Hot spell.
	CAMPANULACEAE—				
25/11/26	<i>Isotoma petraea</i>	12/12/26	12	17 days.	Hot spell.
25/11/26	<i>Isotoma petraea</i>	Several sowings	before Winter	None germinated.	
	RUTACEAE—				
25/11/26	<i>Boronia Purdiana</i>	22/3/27	3	10 days.	
25/11/26	<i>Boronia ovata</i>	5/12/26	1	10 days	
	SAPINDACEAE—				
25/11/26	<i>Diplopetalis Huegelii</i>	5/12/26	1	36 days.	Temp. over 100 dg.
25/11/26	<i>Diplopetalis Huegelii</i>	31/12/26	2	88 days.	Seed 3 years old.
1/1/28	<i>Dodonaea stenopygia</i>	30/3/28	1	102 days.	Seed 3 years old.
1/1/28	<i>Dodonaea stenopygia</i>	13/4/28	1	117 days	



Photos, H. M. Hale

THE MEXICAN AXOLOTL.

It would be as well to remind aquarists when breeding Axolotls, that an unlimited supply of live food must be available, as the appetites of these little fellows seems to be beyond appease, and the procuring of sufficient *Daphnia* during the winter time is not an easy matter, I, personally, have had to travel a distance of fourteen miles every week end to obtain a fresh supply.

At the time of writing (2/8/28) I have seventeen fine healthy youngsters and I hope that all of these will grow to their full larval maturity, when further experiments may be undertaken with a view to the breeding of the matured Salamander.

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THE MEXICAN AXOLOTL IN SOUTH AUSTRALIA.

By Herbert M. Hale, Curator, South Australian Museum.

Plates I and II.

Our most familiar representatives of the Amphibia (or Batrachia) are the frogs and toads. In these, the tadpole, or larva, has a long tail, but at about the period of metamorphosis (that is, when the frog or toad becomes an air-breather) this tail is absorbed. The so-called long-tailed amphibians (the newts, salamanders, etc., none of which is indigenous to Australia) have a tail which persists throughout the life of the animal. Like the frog, however, the newts and salamanders possess gills in their early stages, but most of them later develop lungs and lose the branchiae. The Mexican Axolotl (*Amblystoma tigrinum*) is an exception in that it may retain its gills and its strictly aquatic habit throughout life, and even breeds in this pseudo-larval condition.

In 1917 the late Mr. Waite successfully imported several living Axolotls into South Australia, and in the spring of that year reared a brood from them in his aquaria. Two of the newly hatched progeny were given to me, and after having been in my possession for two years, spawned on October 27th, 1919. Curiously enough the other members of the brood, although under different conditions and temperatures, spawned during the same week. It has been stated that the Axolotl will not breed until it is two years old, and as none of the first brood spawned until 1919 this seems quite probable.

The breeding habits are described by Zerneck (1) as follows. In the spring, when the Axolotl is about to breed, the vent opens somewhat and looks red and inflamed. The sexes are

(1) Zerneck, Leitfaden für Aquarien und Terrarien-Freunde, 1913. p. 346.

easily distinguished as the testicles of the male show as a large ovular lump on each side of the vent. For two or three days the male chases and drives the female, attempting to get underneath her. The greatest activity occurs at night. The male finally deposits several skittle-shaped masses of a putty-like substance, at the top of which are the spermatozoa. The female touches these with her mouth and then glides over the top of them so that the spermatozoa enter her sexual organ. In 36 to 40 hours the eggs are deposited on weeds, the number varying from 300 to 500 generally, although large specimens have been known to deposit as many as 1000 eggs.

Although the fertilization was not actually witnessed I had proof that impregnation occurs before oviposition in the following manner. A large aquarium containing the pair of Axolotls had sprung a leak, which necessitated the removal of the occupants, which were temporarily placed in smaller and separate vessels. The day after which she was thus inadvertently parted from her consort the female deposited a large number of fertile eggs.

The embryos in the newly laid eggs were perfectly spherical, but a few hours after deposition were as shown in fig. 3; a photograph of a dead egg is reproduced in fig. 2, and this illustrates the shape of the freshly laid ovum. On the following morning the embryo was by no means spherical (fig. 4) and 72 hours after deposition distinctly showed two projections—the head and tail (fig. 5). On November 1st (fifth day after deposition) the young commenced to move in the egg-capsules, and changed their position occasionally, while slight swellings at the sides of the head indicated that the gills had commenced to develop externally (fig. 6). Next day the eyes and branchiae were clearly visible, the dorsal and ventral fin-membranes could be seen and the yolk-sac was quite small (fig. 7). Although a cool change at this stage retarded development somewhat, the weather on the whole was exceptionally warm at the time, and during the next two days the now feathery gills rapidly increased in length, and the embryos showed a further increase in bulk (figs. 8-9). Most of the larvae hatched on the ninth day after which the eggs were laid. The time occupied by the development of the ova is by no means constant, however; the spawn from Mr. Waite's original pair did not hatch until nearly three weeks after deposition, and in 1920 a batch which I placed in a cool situation also developed very slowly.

Until the larva develops the first pair of legs it is somewhat ungraceful, and rests on the bottom in various awkward positions (fig. 10).

As indicated above, the spring is the natural spawning season but, as described in another note on the Axolotl in this issue, during the last three or four years some of the specimens in South Australia have spawned in mid-winter. This unsatisfactory procedure can, of course, be obviated by separating the sexes during the winter.

One of my original pair of Axolotls was pigmented—of a dark olivaceous colour, mottled with brown—but the other was an albino. Albinism is by no means uncommon, and always a number of individuals of a brood of Axolotls are colourless and semi-transparent, so that the blood in the gills is visible, while even ingested food, such as living earthworms, may be seen in the stomach. The aforementioned white example was photographed a year after it was hatched (fig. 1). The Axolotl readily reproduces lost limbs and it may be of interest to mention that three or four months before the photograph was taken the albino had lost the whole of both front legs and portion of the tail during a disagreement with its mate, but had re-developed these parts in the interim. The dark example is still alive after eleven years of life in aquaria, and is now about a foot in length. This period of life has been far exceeded in the case of other salamanders, and it is on record that "A giant salamander, thought to be 150 years old, was recently presented to the Prince Regent of Japan by the head priest of a temple near Asakura. The amphibian has been living in a pond in the temple grounds for more than 130 years." This specimen was over four feet in length! The Giant Salamander lives in the mountain streams of Japan and West Central China, and a cast of the species, in company with casts of other amphibians, is displayed in the South Australian Museum.

Those who have studied the Axolotl in aquaria know that occasional specimens suffer from a queer complaint, the reason for which, so far as I am aware, has not been accounted for. The gut and stomach become greatly distended with water and in this bloated condition the creature is unable to efficiently control its movements and remains near the surface. Notes regarding this abnormality have been published from time to time and the late Mr. Waite, under the title "A Bloated Axolotl" (2) described and illustrated an example distended in this way. I have noticed that the cause, whatever it may be, may operate even in the case of unhatched larvae, and fig. 11 shows a well-developed juvenile, still alive in the egg-capsule, thus affected.

(2) Waite, *Aquatic Life*, iv, 1918, p. 41, figs.

EXPLANATION OF PHOTOGRAPHS OF AXOLOTL.

Plates I and II.

Fig. 1. An albino 12 months old.

Fig. 2. A dead egg.

Figs. 3-9. Development of an ovum; 3, first day, a few hours after deposition; 4, second day; 5, third day; 6, fifth day; 7, sixth day; 8, seventh day; 9, eighth day.

Fig. 10. A young larva.

Fig. 11. A "bloated" embryo.

(Fig. 1, $\frac{1}{2}$ nat. size; figs. 2-11, enlarged 4 diams.)

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SOUTH AUSTRALIAN SHELL COLLECTORS' CLUB.

Further study of local bivalves was continued by the Club members during the past quarter.

Family SPONDYLIDAE.

Spondylus tenellus, Reeve. Upper valves (left) are frequently found cast up, generally denuded of spines. The lower (right) firmly attaches itself to a rock, rarely coming adrift—hence the infrequency of finding complete specimens. An average shell (about 2 inches across) has numerous rows of oblique spines, increasing in length as the ventral margin is reached. This red-brown bivalve belongs to a family noted for beauty of form and coloration. The wonderfully delicately tinted spines of specimens from warmer seas overlap and twist about each other in glorious confusion have long excited the admiration of shell lovers. The interlocking valve teeth are simple, though very perfect.

Family LIMIDAE.

Certain species are fairly common in S.A. A dredging excursion in St. Vincent's Gulf by Field Naturalists brought to the surface many living *Lima angulata*. Embedded in a mat of sponge-like substance, these small shells were noted to be resting in a vertical position, each in a separate nest or compartment. When placed in a jar of seawater an interesting picture presents itself as they move about by the opening and sudden closing of their valves. A sheaf of brightly colored tentacles trails behind.

Lima angulata, Sowerby, varies the usual whiteness of the valves of this family by faint patches of brown. The specimens taken on the above occasion averaged $\frac{3}{4}$ inch in length.

L. multicostata, Tate. The pure white valves, about $1\frac{1}{2}$ inches long, radiately ribbed, are occasionally found on our local beaches.

L. strangei, Sowerby, comes from Spencer Gulf. Its narrowed valves are twice as long as broad. The triangular hinge area is notable.

Family *ANOMIIDAE*.

Monia iona, Gray. Of thin, pearly structure, this bivalve commonly attaches itself to an oyster, to which it modifies, in growth, its normally flat under valve to suit any irregularities of lodgment. An unusual feature of *Anomia* is the pear-shaped aperture or notch from which a fleshy byssus extends, fastening itself by a pearly plate to some fixed object. This fragile shell, often taken about 1 inch across, is moderately common in South

Family *MYTILIDAE*.

This group is familiar to all who visit our coastline. Jetty piles, rocks, floating buoys, and ship bottoms are favored habitats to which they cling in countless numbers. Matted together, others form patches of flooring of tidal reaches, indeed, few lodgments come amiss to these accommodating bivalves. World-wide in distribution, every coast and harbor has its representatives. These wedge-shaped shells are joined by a long, toothless hinge, and an internal ligament. Some species carry a shaggy, hairy periostracum. The valves are internally nacreous. The attachment to some solid body, or to each other is effected by a thick bunch of byssal threads. Reproductive powers must be prodigious, as an examination of a group discloses individuals of all ages packed together in mass formation. Five sections of the Family *Mytilidae* are represented in South Australia, viz.:—*Mytilus*, *Brachyodontes*, *Modiolus*, *Musculus* and *Gaimardia*, each with distinctive features.

Well known members of some of these divisions are as follows:—

Mytilus planulatus, Lamarck, has been taken at the Outer Harbor, but it is thought to be an introduction from Victorian waters, where it is common. One local shell measured $3\frac{1}{4}$ inches.

Brachyodontes hirsutus, Lamarck. The hairy covered valves are about one-third more in length than breadth. Members noticed that some of the hairs carried thorn-like processes. The byssal notch appears in an almost midway position.

B. erosus, Lamarck. The chestnut colored valves of this specimen are ridged longitudinally, with crenate edges. The beaks are terminal. A very common shell.

Modiolus albicostus, Lamarck. This handsome mussel attains a length of from four to five inches. The beaks are sub-terminal. The color is a shining chestnut brown. Fine specimens have been collected from Middleton Beach. A rather rare find.

M. australis, Gray, is frequently found on our Gulf beaches, often with a piece of seaweed growing from one of the valves. Much inflated in front, these concentrically striated shells carry a bearded periostracum.

M. confusa, Angas, is the small, black mussel that covers rocks and jetty piles, ready to scrape the incautious bather. In addition to taking part in the general economy of ocean life, this little shell serves a useful purpose in protecting submerged timbers of jetties and wharves from ravages of the boring ship-worm, *Teredo*. This destructive wood-borer requires for its well being and existence a free outlet for its siphons from its tube to the surrounding water which becomes impossible when the pile is thickly encrusted with small mussels.

F. TRIGG,

July, 1928.

Hon. Secretary S.A. Shell Collectors' Club.

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THE SOUTH AUSTRALIAN AQUARIUM SOCIETY.

A meeting of the South Australian Aquarium Society was held at the rooms of Mr. J. W. Hosking, Sydenham Road, Norwood, on Tuesday last. Mr. H. M. Hale, Curator of the South Australian Museum, occupied the presidential chair, and apologies were received for the non-attendance of several members. Two new members, Messrs. J. Wolff and A. A. W. Daws, were elected. After the business of the meeting, Mr. H. M. Hale gave an interesting lecture upon Micro and Aquatic life photography. His remarks were illustrated with lantern slides, showing each phase of the subject discussed. Views were shown of Saville Kent at work upon the photography of the fishes, Crustacea, and corals, upon his memorable expedition to the Great Barrier reef. The lecturer also exhibited a fine collection of slides of popular aquarium fish and emphasised the necessity of photographing certain of our native fishes without the detracting effect of plant growth backgrounds. In the Micro-photography section he illustrated the life history of the common house mosquito (*Culex fatigans*), showing the complete life cycle of this insect, together with views and facts concerning the deadly species of Malaria mosquito (*Nyssorhynchus annulipes*). He then dealt with Micro-photography of wings of various mosquitoes and flies and convinced the members present of the limitless scope that lies for investigation in this direction. At the close of the lecture Mr. J. W. Hosking showed a series of Micro-photographs of other

insects. At a committee meeting held at the conclusion of the lecture, it was decided to hold an exhibition of native fishes by the members at the meeting on September 11th, when Mr. C. F. Blewett will describe the breeding habits of *Mogunda adspersus* and *Melanotaenia nigrans*. Mr. Blewett is the first aquarist to breed the last named, which is the daintiest and most beautiful Australian fish in captivity.

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ADDITIONS TO OUR LIBRARY.

"Microscopic Fresh Water Life." By F. J. W. Plaskitt.

This volume gives the result of the author's thirty years of study in this interesting branch of natural history. Simply written and profusely illustrated, it should be of great interest to many members.

"Concerning the Habits of Insects." By F. Balfour-Browne.

The habits and ways of insects are charmingly portrayed.

"Forest Insects and Timber Borers." By Walter Froggatt, F.L.S., Forest Entomologist.

This volume is a partial record of the work of Mr. Froggatt in connection with the study of the increase in timber pests and the best methods to be adopted to check their ravages, and to prevent the importation of foreign species. The papers are splendidly illustrated and the descriptions very full. A fine colored frontispiece represents the Black Cockatoo as the "Forest Guardian." Our thanks are due to Mr. Froggatt, who has been good enough to present this valuable volume as an addition to our Library.

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EXCURSIONS.

EXCURSION TO GLENELG NORTH, JUNE 2nd, 1928.

The Shell Club conducted a party of members along the beach, gathering a number of interesting species, which were described by various members of the club.

EXCURSION TO WILLIAMSTOWN, JUNE 4th, 1928.

A party of members partly filled the charabanc and decided to brave the threatening storm. The road through the gorge revealed many fresh beauties. On arriving at Williamstown the party was hospitably received by the head teacher of the public school, Mr. Herbert Spencer.

After partaking of refreshments, the party, under the guidance of Mr. Spencer, inspected the school plots, the memorial

park, and some natural scrub in the vicinity. The route home via Anstey's Hill was a very picturesque one, and botanists of the party gathered interesting specimens.

VISIT TO THE BOTANIC GARDENS, JUNE 23rd, 1928.

The Director, Mr. J. F. Bailey, escorted a large party over the Gardens and the members spent an interesting time in listening to Mr. Bailey's lecturettes on the various plants, particularly the specimens of trees.

EXCURSION TO THE NATIONAL PARK, JULY 7th, 1928.

Dr. R. S. Rogers met the party and gave an interesting talk on the orchids found, as well as a fund of information on orchids in general.

VISIT TO THE MUSEUM, July 21st.

Led by the Chairman of the Section, Mr. W. Champion Hackett, a number of members visited the Museum, where they were met by the Curator (Mr. H. M. Hale), and Mr. N. B. Tindale.

A few of the many interesting sections of the Museum were visited. The Curator drew attention to a number of crustaceans and fishes, and described their life histories and habits. Insects of many species were shown and Mr. Tindale spoke of these and the beetles, including specimens of many species of destructive timber borers. Mr. Tindale also described part of the aboriginal collections and chatted interestingly on his visit to Groote Eylandt.

EXCURSION TO GRANGE CREEK, AUGUST 4th, 1928.

A party led by members of the Shell Club visited this locality and spent a profitable afternoon.

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LECTURES.

"MICROSCOPIC EVENING," MAY 15th, 1928.

The Microscopical Section held a very successful meeting on May 15th, and Messrs. Harding and Collins, with many other members, made exhibits and explained the slides.

"PEEPS IN OTHER LANDS", JUNE 19th, 1928.

The lecture by Mr. P. H. Williams was well attended and the lecturer entertained members with an interesting account of his travels and adventures illustrated by a fine series of slides.

"OUR BIRDS," JULY 17th, 1928.

Mr. A. G. Edquist gave a very informative and interesting talk to a large gathering of members and friends. With the aid of slides he held the attention of the audience and gained their sympathy in the efforts to protect our wonderful Australian feathered friends.

EXCHANGES.

1. The Victorian Naturalist: May, June and July numbers. Victorian ferns and lilies are described and illustrated.
 2. The Tasmanian Naturalist. June number. The Birds of Tasmania are dealt with.
 3. The South Australian Ornithologist. July number. Mr. C. Pearce writes on the birds observed at St. Francis Island, Far West Coast.
 4. The Australian Museum Magazine for July, September and for October-December. The Dugong, Crabs, the Barrier Reef, Harmful Spiders, Case Moths and other natural history subjects are interestingly dealt with and well illustrated.
 5. The Thirty-third Annual Report of the John Crerar Library, Chicago, U.S.A.
 6. Annual Report of the Polish National Museum of Natural History, Warsaw.
 7. The Australian Forestry Journal for June, 1928. Articles on *Pinus insignis* and on Forestry in South Australia should prove of interest.
 8. The West Australian Naturalists Club Report for July, 1928. An item of special interest is the report of the finding of a new Orchid and a new species of Sheoak (*Casuarina fibrosa*), peculiar in having its cone closely covered with hairs resembling a dense wool.
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Members whose subscriptions are in arrears are requested to let the Treasurer (or Mr. B. Beck) have the amount as soon as possible.

